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Laura A. Halvorsen

Antioch University - New England

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Understanding Peritraumatic Dissociation:
Evolution-Prepared Dissociation, Tonic Immobility, and Clinical Dissociation

by

Laura Halvorsen

B.A., Hamilton College, 2009
M.S., Antioch University New England, 2012

DISSERTATION

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Department of Clinical Psychology

DISSERTATION COMMITTEE PAGE

The undersigned have examined the dissertation entitled:

**UNDERSTANDING PERITRAUMATIC DISSOCIATION: EVOLUTION-PREPARED
DISSOCIATION, TONIC IMMOBILITY, AND CLINICAL DISSOCIATION**

presented on November 14, 2013

by

Laura Halvorsen

Candidate for the degree of Doctor of Psychology
and hereby certify that it is accepted*.

Dissertation Committee Chairperson:
Victor Pantesco, EdD

Dissertation Committee members:
Barbara Belcher-Timme, PsyD
Amanda Hitchings, PsyD

Accepted by the
Department of Clinical Psychology Chairperson
Kathi A. Borden, PhD

on **11/14/13**

* Signatures are on file with the Registrar's Office at Antioch University New England.

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Abstract

Current literature on the relationship between posttraumatic symptoms and dissociation that occurs during the time of a trauma, or peritraumatic dissociation, appears to be contradictory and inconclusive. Conflicting findings in the empirical literature that disagree on the nature of this association (whether peritraumatic dissociation is a risk factor for PTSD or a neutral or even protective evolutionarily-derived phenomenon) may originate from the lack of conceptual clarity regarding the construct of dissociation, and lack of differentiation between peritraumatic dissociation and dissociation that persists after a traumatic event. This dissertation details a theory for differentiating clusters of peritraumatic dissociation based on distinct phenomenology, neurological profiles, and evolutionary or adaptive purposes. These clusters are hypothesized to carry different degrees of risk for developing persistent dissociation and posttraumatic symptoms. These theoretical clusters will be applied to existing autobiographical accounts of traumatic experiences to illustrate their phenomenological differences. A comprehensive study design entailing factor and cluster analysis to empirically investigate the notion of discrete clusters of peritraumatic and persisting dissociation patterns of trauma response, and to determine the associations between each natural “grouping” of peritraumatic dissociation and posttraumatic symptom severity is proposed. Finally, implications of the theory and proposed study, as well as possible limitations of the theory, are discussed.

Keywords: peritraumatic dissociation, dissociation, PTSD, trauma

Understanding Peritraumatic Dissociation: Evolution-Prepared Dissociation, Tonic Immobility, and
Clinical Dissociation

Chapter 1: Statement of the Problem

Dissociation is broadly defined as a “partial or complete disruption of the normal integration of a person’s psychological functioning” (Dell & O’Neil, 2009, p. xxi). As a construct, dissociation has had widely varying definitions and colloquial uses, and thus, has suffered from poor conceptual clarity (Dell, 2009b; Dorahy & van der Hart, 2007). The psychological community uses the “broad” conceptualization of dissociation to describe a diffuse range of experiences that may have little to do with each other in either phenomenology or mechanism—for example (and not limited to), a breakdown in integrated information processing, the simultaneous engagement of multiple streams of consciousness, a divided personality structure, and alterations in consciousness (Dorahy & van der Hart, 2007). This dissertation details the ways in which the lack of clarity in the construct of dissociation applies to our notions of peritraumatic dissociation and ambiguates the research of peritraumatic dissociation and PTSD. This exploration of the vagueness around definitions and research of peritraumatic dissociation informs a proposed theory explaining this lack of clarity: that there are distinct clusters of experience that are all currently grouped under the overarching umbrella of peritraumatic dissociation, but that have contrasting neurobiological, experiential, and evolutionary mechanisms.

The arguments set forth in this dissertation require making explicit several basic tenets of dissociation and trauma. For the relationship between dissociation and acute trauma, dissociation is commonly understood to occur either during and/or persistently following a traumatic experience. There is some uncertainty about whether dissociation during or immediately after the

traumatic experience should be regarded as normative or even a healthy coping response, versus a risk factor for persistence of dissociation and subsequent escalation into the full Post-Traumatic Stress Disorder (PTSD) syndrome. Many studies support the risk factor conceptualization (Breh & Seidler, 2007; Griffin, Resick, & Mechanic, 1997; Marmar et al., 1994; Ozer, Best, Lipsey & Weiss, 2003), while others have found that the relationship between peritraumatic dissociation and later development of PTSD disappears when other variables, such as persisting dissociation or rumination after the trauma, are controlled for (Briere et al., 2005; Halligan, Michael, Clark, & Ehlers, 2003; Murray, Ehlers, & Mayou, 2002). One study even found depersonalization, a type of dissociation, to be protective against later psychopathology if experienced during the course of a traumatic event (Shilony & Grossman, 1993). Clearly, peritraumatic dissociation is a variable that needs more specific and contextual analysis to evaluate its status as a predictor of posttraumatic symptomatology.

The way that peritraumatic dissociation is conceptualized in the context of trauma is problematic. The label is insufficiently specific and has been applied to such a wide range of phenomena that it risks becoming meaningless (Allen, Console, & Lewis, 1999; Dorahy & van der Hart, 2007; McNally, 2003). It is necessary theoretically to clarify the notion of peritraumatic dissociation in order to more clearly study its relationship with posttraumatic stress. Some authors have suggested considering peritraumatic dissociation as separate constituents rather than collecting everything under the same label. For example, Bryant (2007) proposes that dissociation is comprised of time distortion, reduced awareness, emotional numbing, amnesia, and derealization. Others argue that these divisions are still too broad, as these components do not differentiate between structural dissociation and other alterations of consciousness (Steele, Dorahy, van der Hart, & Nijenhuis, 2009). Regardless of the theorized divisions of peritraumatic

dissociation, it is becoming more commonly recognized that constituent components are present to varying degrees as part of a trauma survivor's dissociative experience, and may more reliably predict PTSD development than the broader construct.

Dell (2011) proposes that research should assess the independent effects of natural groupings of dissociation that have unique neurophysiological mechanisms (for example, cortical bases versus subcortical bases of dissociation) rather than each "type" of dissociation symptom described by Bryant or other theorists. Although dissociation may appear to have similar cognitive or phenomenological features, these features arguably derive from different mechanisms (Dell, 2009b). Dell hypothesizes that these mechanisms are most clearly divided into at least three natural groupings: evolution-prepared dissociation, tonic immobility, and clinical dissociation (Dell, 2011).

Proposed Theory and Study

As discussed earlier, researchers have begun to articulate the fundamental problem with the way that peritraumatic dissociation is currently studied—that the label "dissociation" is insufficiently specific. The way that peritraumatic dissociation is generally investigated is to identify any alteration of consciousness that occurs during the span of a trauma and label it as peritraumatic dissociation. This wide-net method has predictably led to variable and inconsistent results regarding an association with subsequent PTSD symptomatology. Further, many current measures of peritraumatic experiences, including tonic immobility, either assess a range of experiences with varying origins (Dorahy & van der Hart, 2007) or each measure specific domains that are largely unconnected (P. Dell, personal communication, February 20, 2011). Dell and Lawson (2009) argue that any investigation of the structure of dissociation itself must include an instrument or instruments that provide comprehensive coverage of all experiences that

are dissociative in nature.

This dissertation provides a theoretical framework for considering clusters of peritraumatic dissociation that can be meaningfully differentiated along the lines of phenomenological experience, neurobiological basis, and evolutionary purpose. These clusters are consistent with existing research differentiating evolution-prepared dissociation, tonic immobility, and clinical dissociation. I argue that these clusters may carry differential risk for persisting dissociation and posttraumatic symptomatology, including the dissociative subtype of PTSD. This framework is applied to existing first-hand accounts of trauma to illustrate phenomenological differences between clusters.

The proposed theory opens to a factor analysis and cluster analysis research design that would explore whether peritraumatic dissociation can be naturally inserted into discrete dissociative groupings as predicted by the theory. That research design would also measure persisting dissociation for inclusion in the cluster analysis, as neglecting to differentiate persisting from peritraumatic dissociation has obscured existing research on the link between peritraumatic dissociation and PTSD. Finally, the design would quantify and include PTSD symptom severity in the cluster analysis to determine associations with clusters of peritraumatic and persisting dissociation.

Chapter 2: Review of the Literature

This literature review section more fully describes relevant history of the study of dissociation (insofar as it is still present in contemporary tension between theories of dissociation), literature on peritraumatic dissociation, research on hypnotic susceptibility and absorption, trajectories of posttraumatic sequelae, associations of peritraumatic and persisting dissociation with posttraumatic symptomatology, the underlying defensive subsystem that characterizes peritraumatic dissociation, taxonomies of dissociative experiences, and methodological and measurement limitations in peritraumatic dissociation research. These topics are considered relevant to the lack of clarity associated with the concept and research of dissociation, and development of the theory of distinct peritraumatic dissociation groupings. This review provides the foundation for both the presented theory and proposed study design.

Historical Themes and Current Controversy in the Study of Dissociation

This section details the competing models of dissociation and the contexts of these notions, particularly those delineated by Pierre Janet and Sigmund Freud. The differences between these models are compared and contrasted, and their foundational traces in the present day ambiguity surrounding notions of the purpose and mechanism of dissociation are discussed. This section also discusses the opposing paradigms of dissociation as a continuum (a dimensional view extending from “normative” dissociation to pathological dissociation) and as a taxonomy (discrete types of dissociation), which entail differing assumptions about the distribution and mechanisms of dissociation.

Janet and Freud. The present theory and study of dissociation reflects differing theorists’ and practitioners’ early conceptualizations of dissociation. Janet was the first person to link dissociation with psychological trauma and develop a theory of “subconscious psychic

determinism” (Howell, 2005, p. 49). Janet’s concept of dissociation was highly influenced by his research on hysteria and the hypnosis literature (Dell, 2010). He wrote that dissociation was a passive disaggregation of the psychological system during moments of intense stress. His position was that dissociation is not a normative defense. It is *always* an abnormal occurrence and only with people who are already psychologically compromised and with limited integrative capacity to “bind” experiences with all their associated components. This does not only entail constitutional vulnerability but also physical illness, exhaustion, and particularly the overwhelming affect associated with traumatic stress (Howell, 2005). This limited integrative capacity, with lowered ego strength and level of mental efficiency, is called “retraction in the field of consciousness” (Steele et al., 2009). Janet suggested that retraction in the field of consciousness, combined with a disposition to somnambulism (more commonly known now as high hypnotic susceptibility; Dell, 2009b), may result in dissociation. Thus, dissociation would not occur in normal individuals (Putnam, 1989), does not involve skill, and has no adaptive purpose. In Janet’s first law of dissociation, ideas and psychological functions can be conscious but are not connected with the subjectivity of the primary personality. Instead, these psychological functions, ideas, and sensations are associated with a second consciousness with its own sense of “I” (Janet, 1887, as cited in Dell, 2009b). These secondary systems involve somatic and psychobiological states (Howell, 2005). This means that aspects of experience are not “split off” or “broken away” from the primary personality, which is assumed to be whole and never came into contact with the trauma in the first place. Instead, field of consciousness becomes so restricted that the traumatic material bypasses primary consciousness entirely and is associated with a secondary system that has its own motivation and purpose (Dell, 2009b). Thus, dissociation is essentially a deficit of the capacity to synthesize, and the more it happens, the

more dissociative symptoms become persisting and problematic.

In *L'automatisme psychologique* (1889), Janet argues that the central phenomenon of dissociated functioning is the automatism, or behaviors deriving from a secondary subsystem with its own conscious intelligence, on their own and without direction from the primary personality (Dell, 2009b). Total automatism occurs when activity from the secondary psychological system completely takes over the functioning of the person. Partial automatism occurs when the primary and secondary psychological systems are simultaneously active, with the result that the person experiences nonvoluntary intrusions of thoughts, memories, actions, or sensations into conscious experience (Janet, 1889, p. 224, as cited in Dell, 2009b). Dell argues that intrusions from automatisms is the central experience of individuals with a dissociative disorder (Dell, 2009a).

Janet's notion of dissociation as passive disaggregation has several features that contrast with Freud's concept of dissociation. Freud's idea of repression was an active mental process designed to push away unacceptable or painful thoughts, memories, or associations (Frankel, 1990). Freud believed that this was normal and occurred in all individuals as defense, which differed from Janet's view of dissociation as pathological and without adaptive purpose (Dell, 2009b). Further, Freud's dissociation requires constant effort to maintain, while Janet believed that the continued disaggregation of mental content is effortless once it happens (Dell, 2009b). Although dissociation and repression appear to be superficially similar, their theoretical origins and basic assumptions differ along the lines of defense (repression) versus deficiency (dissociation; Vermetten, Bremner, & Spiegel, 2002).

Some theorists have combined these contrasting notions of dissociation in certain ways. For example, contemporaries of Janet, including Morton Prince and William James, believed that

dissociation is a normative process that becomes pathological only in some circumstances (Putnam, 1989). Further, some clinical data contradicts the Janetian idea that traumatic material never enters primary consciousness in the first place, as it is established that a dissociated traumatic event can also limit an individual's memory of related events that had been experienced and consciously known (Dell, 2009b). Thus, some theorists endorse Janet's description of the process of dissociation but favor Freud's explanation of it as protective. Dell suggests that dissociation may begin with repression and associated efforts to drive unacceptable material from conscious awareness. In people with high hypnotic susceptibility this may spontaneously activate dissociation. This successful hypnotic forgetting is effortless to maintain after the initial repression effort, although subsequent reminders of the trauma may elicit intrusions that necessitate repeated efforts to repress the material (Dell, 2009b).

Most contemporary models of dissociation have emerged from the writing of Janet, and current assumptions and metaphors of dissociation reflect historical tension between Freud and Janet. The literature captures two metacategories of dissociation as a metaphor: the self as passive victim that is damaged by its encounter with trauma, or the self as an agent that engages in dissociation as a controllable action (Way, 2006). These metaphors display contention between structural metaphors ("parts," "systems") and action metaphors ("splitting off," "dissociating"), which reflects conflict between Janet and Freud's conceptualizations (Dell, 2009b). Dell argues that when we use dissociate as a verb, particularly a transitive verb (e.g. "dissociating away memories"), this derives from a Freudian lens of repression, which is active, effortful, and self-protective (Dell, 2009b). Theorists seem to use structural metaphors more often, whereas clinicians seem to prefer action metaphors (Dell, 2009b).

Taxon and continuum models of dissociation. Another subject of contention in the

study of dissociation is the tension between notions of dissociation occurring on a continuum (from normal dissociation on one end all the way to dissociated identities on the other end) versus distinct types of dissociative experience and mechanism. The notion of dissociation as a continuum has origins in the study of hypnotic susceptibility by Hilgard, Spiegel, and other hypnosis researchers (Frankel, 1990). This model is also advanced by studies of depersonalization and dissociation that use rating scales (Putnam, 1989). Although the idea of dissociation occurring as a continuum has dominated the dissociation research for the past 30 years (Dell, 2009b), this view is being challenged by contemporary theorists. For example, most empirical research on dissociation uses the Dissociative Experience Scale (DES) as a tool to measure dissociation. Although the measure originally reflected an assumption of dissociation as on continuum, some studies argue that the scale can identify two types of dissociation: (a) nonpathological types of dissociation; and (b) a pathological dissociative taxon identified with 8 items of the DES (called the DES-T), which is a unique “type” of dissociation that is inappropriate to measure dimensionally (Allen, Fultz, Huntoon, & Brethour Jr, 2002; Waller, Putnam, & Carlson, 1996). None of the absorption items from the DES are included in the taxon, which includes more items measuring amnesia, depersonalization/derealization, and identity alteration (Waller, Putnam, & Carlson, 1996). Although it is tempting to conclude from this study that absorption is unrelated to pathological dissociation, others advocate that high capacity for absorption may be a crucial link in the development or maintenance of pathological dissociation (Dalenberg & Paulson, 2009). In this view, absorption should continue to be evaluated for its role in pathological dissociation.

Advocates of the “narrow” view of dissociation (as opposed to the “broad” view, which subsumes all breakdown of usually integrated functioning under one label) base their definitions

of dissociation in the early Janetian view of an organized division of personality. This view assumes that dissociative experience derives from dissociated structures (Dorahy & van der Hart, 2007). Thus, the presence of dissociation indicates two or more systems of functioning that each have their own perception, cognition, affect, behavior, and sense of self (Steele et al., 2009). According to this view, all disruption in integrated functioning that can be called dissociation is essentially structural dissociation of the personality, and it is taxonomically distinct from other alterations of consciousness. Alterations of consciousness may be either pathological (excessive, frequent, or inflexible) or nonpathological (healthy trance states, normal absorption), but if they do not originate from divided systems of functioning, they cannot be called dissociation (Steele et al., 2009). Structural dissociation leads to alteration of consciousness, but most persons who experience alterations of consciousness do so without structural dissociation. One way in which structural dissociation is differentiated phenomenologically from general alteration of consciousness is the consistency of the sense of self. When nondissociative individuals experience alterations of consciousness, they do so with a relatively stable and continuous sense of self across time and experience. In contrast, the sense of self in those experiencing structural dissociation feels fragmented and inconsistent (Steele et al., 2009). Another marker of structural dissociation in the context of depersonalization and derealization is the presence of an “observing” self, or out-of-body experiences.

Dating from the later part of the 19th century, dissociation as a field of study has historical roots in clinical observation of hysteria and hypnotic susceptibility (otherwise known as hypnotizability), and these areas of study have intersected at multiple junctures. Given that many clinicians’ commonly held notions of dissociation resemble trance-like, absorptive, or hypnotic states, it is relevant to visit the literature on hypnotic susceptibility and absorption in the current

context.

Hypnotic Susceptibility

Hypnosis results from three main components: absorption, dissociation, and suggestibility (Spiegel, 1991). Absorption is defined as the tendency to become wholly involved in a perceptual or imaginative experience (the higher the capacity for absorption, the higher the hypnotic susceptibility; Faymonville, Boly, & Laureys, 2006). In this view, dissociation is considered to be the division of aspects of behavior or perception that would typically be processed simultaneously, and suggestibility enhances a tendency to comply with hypnotic instruction (Spiegel, 1991). The typical experience of hypnosis (a term that has been used interchangeably with “trance” in some literature; Pekala & Kumar, 2000) is one in which one’s critical judgment is suspended because of full absorption in a hypnotic state. The person remains aware of who she is, and undergoes a vivid and coherent perceptual and imaginal experience that fills her consciousness (Faymonville, Boly, & Laureys, 2006). The absorption creates a state of highly focused attention in which there is complete involvement in a single dimension of experience, such as an idea or memory (similar to the “retraction in the field of consciousness” characterized by Janet; Butler, Duran, Jasiukaitis, Koopman, & Spiegel, 1996). This heightened focus of attention necessitates that other material falls to the periphery of attention and consciousness. Attentional mechanisms are highly implicated in hypnotic states (Raz, Fan, & Posner, 2006). Individuals with high hypnotic susceptibility have the capacity to become involved in internal stimuli (and thus distanced from the environment), but also can become absorbed in external stimuli (Vermetten, Bremner, & Spiegel, 2002). Highly hypnotizable individuals are able to modify brain metabolism in response to instruction to alter emotion, pain or other perceptual function (Vermetten & Spiegel, 2007).

Hypnotic susceptibility appears to have much overlap with dissociative experience, and has been characterized as the fundamental capacity to experience dissociation in a structured setting (Vermetten & Spiegel, 2007). Some researchers believe that hypnosis is a form of dissociation (Frischholz, 1985), although this argument is derived from evidence that people with dissociative identity disorder typically are rated as having more hypnotic susceptibility than healthy controls. There may be other reasons why individuals with the capacity for dissociation have hypnotic susceptibility, and other researchers argue against equating hypnotic susceptibility scores with capacity for dissociation (Frankel 1990), hypnotizability may be a crucial aspect of some kinds of dissociation. In the nineteenth century, Breuer was the first to suggest the link between high hypnotizability and repression, arguing that the disposition to hysteria had three components: tendency to conversion of affect into somatic phenomena, disposition for suggestibility, and capacity for hypnoid states (essentially hypnosis of the self, or auto-hypnosis; Dell, 2009b). Janet also believed that hysteria was essentially an autohypnotic phenomenon (Butler et al., 1996). More recently, researchers have proposed that absorption, fantasy proneness, and hypnotizability should be considered diatheses for dissociative disorders (particularly in combination with traumatic stress; Butler et al., 1996), despite the lack of evidence that there is anything inherently dissociative about these constructs (Allen & Coyne, 1995). It is possible to see in dissociative disorders the kind of absorption, dissociation, and suggestibility that constitute formal hypnotic states, and formal hypnosis can produce dissociation of awareness and the kind of automaticity that resembles pathological dissociation (Butler et al., 1996). Hypnotizability underlies the capacity to segregate experience into distinct psychological or psychobiological structures, and it has been suggested that it may take less severe stress or trauma to evoke a dissociative symptom in individuals with high hypnotic

susceptibility (Vermetten & Spiegel, 2007).

At least one line of research attempts to connect hypnotic susceptibility in adulthood with developmental hardship. Hilgard (1972) suggested two possible developmental pathways leading to high hypnotizability in adulthood: 1) childhood imaginative and absorptive capacity continuing into adulthood, or 2) the experience of strict discipline, severe punishment or abuse in childhood (as cited in Putnam, 1989). In support of this theory, it was found that significantly more young adults who had suffered childhood abuse were classified as highly hypnotizable than either young adults who had undergone family disruption (divorce or death in the family) or those who had experienced neither family disruption or abuse (Nash & Lynn, 1985–86).

Currently correlational studies on hypnotizability and dissociation refute the notion that dissociation comes from autohypnosis, and instead suggest that these phenomena are independent and without overlap (Dell, 2009b). However, Dell argues that this conclusion may be an artifact of how these phenomena are typically measured, as our current methods of measurement do not meaningfully distinguish between mechanisms of dissociation or reasons for gaps in memory (Dell, 2009b). Unfortunately, since the revival of the intersection of dissociation and hypnosis in the 1970's (Frankel, 1990), there has been little research on the link between these phenomena, and the fields are relatively isolated. Dell (2010) recommends increased interaction between the fields of hypnosis and dissociation, especially along the associated phenomenon of involuntariness, a key component of both fields.

Absorption

Absorption is a key correlate of both dissociation and hypnotizability, and is characterized as “a disposition for having episodes of “total” attention that fully engage one’s representational (i.e., perceptual, enactive, imaginative, and ideational) resources” (Tellegen &

Atkinson, 1974, p. 268). This kind of functioning enhances the reality of the object of attention, blocks attention to distracting stimuli, and creates an altered sense of reality (Tellegen & Atkinson, 1974). Absorption can either occur with reality-based stimuli (such as a book or movie), or it can be ideational or fantasy-based (Allen & Coyne, 1995). It is a personality characteristic that entails an openness to certain affective and cognitive alterations across different situations (Roche & McConkey, 1990). Similar to hypnosis, individuals with a high capacity for absorption can absorb across a variety of situations if they choose, and any potentially interfering aspect of the situation can be used to ultimately facilitate the experience (Roche & McConkey, 1990).

Absorption appears to have some experiential features in common with dissociation, although there are crucial differences. Depending on the individual's personality and the situation, the disposition for entering altered states can either have a dissociative ("disaggregative") or holistic ("reaggregative") character; while reaggregative experiences can increase performance and concentration, disaggregative experiences can induce more dissociative alterations in consciousness (Roche & McConkey, 1990). Absorption is considered to be an aggregative or narrowing attentional process (focus on specific stimuli while minimizing distraction), whereas dissociation is considered to be a disintegrative attentional process, dividing attentional resources and excluding them from consciousness without focus on particular stimuli (Carleton, Abrams, & Asmundson, 2010). Further, individuals prone to absorption or dissociation have different experiences of self-continuity. In dissociative states, there are multiple self-states characterized by differing intentions, desires, and memories, whereas the absorbed individual experiences the self as simply suspended, or at least transiently loses self-awareness (Hesse & van Ijzendoorn, 1999). The idea of dissociation and absorption

varying along the lines of attention has led some researchers to suggest that dissociation and absorption may represent opposite ends of a continuum depicting distribution of attentional resources (Carleton, Abrams, & Asmundson, 2010). However, others argue that although absorption is certainly a correlate of dissociation, absorption is essentially a hypnotic phenomenon, not a dissociative one (Dell, 2009b).

This overview of the historical roots of the construct of dissociation, as well as the related fields of hypnotic susceptibility and absorption, provides a context for understanding the current controversies and theoretical ambiguity underlying the concept of dissociation. These variable beliefs about the definition and mechanisms of dissociation are relevant to the subsequent sections on peritraumatic dissociation.

Definitions of Peritraumatic Dissociation

Definitions of peritraumatic dissociation in the literature emerge from a central theme of detachment or depersonalization during a traumatic event. Bryant (2009) characterizes peritraumatic dissociation as a collection of strategies designed to reduce awareness of aversive affect and control of thought process during a traumatic event. This causes “disruption in the usually integrated functions of consciousness, memory, identity, or perception” (American Psychiatric Association [APA], 2000, p. 519). More specifically, Pole, Cumberbatch, Taylor, Metzler, Marmar, and Neylan (2006) described peritraumatic dissociation as the experience of time distortion, derealization, depersonalization, or detachment of cognition or perception during or immediately following a traumatic event. Others have noted the similarity between the phenomenology and psychophysiology of peritraumatic dissociation and depersonalization.

Sierra and Berrios (1998) write that the detachment accompanying depersonalization is designed as a biological defense to mitigate the negative experience of extreme affect during

situations involving threat. Indeed, many clinicians believe that dissociation has a protective effect during traumatic experiences by allowing the individual to detach from either the self or the event (Huopainen, 2002), although others (including Janet) believe that peritraumatic dissociation increases risk for persisting pathological dissociation (Bremner & Brett, 1997). It is possible that peritraumatic dissociation is a short-term defensive strategy, initially effective but damaging to long-term functioning.

Noyes and Kletti (1977) interviewed persons exposed to life-threatening danger, and deconstructed the experience of peritraumatic dissociation into frequencies of specific alterations of affect or cognition. They discovered that the most common experience in the context of peritraumatic dissociation (72% of participants reporting) is an altered awareness of the passage of time, specifically time slowing. 61% of participants described a “speeding up” of mental processes; 56% reported a blunting of emotions (calmness or peacefulness); and 52% reported a sense of detachment and separation from either the world, themselves, or the accident.

Alterations in sensory experience either caused sharper-than-usual vision and hearing (35%) or a decrease in sharpness (16%). Participants also described conflicting changes in cognition; 61% described thoughts as unusually distinct or vivid, while 12% reported blurred or dull thoughts. These disparate and bimodal experiences even within one phenomenological domain indicates potentially unique clusters influencing one’s subjective experience of peritraumatic dissociation.

There are several proposed explanations for peritraumatic dissociation. Dissociation following trauma may be a defensive strategy that mitigates aversive emotions because it enables a reduction of awareness of distressing features of the experience (Sierra & Berrios, 1998). Another explanation characterizes peritraumatic dissociation as a compensatory reflex to intense physiological arousal (Bryant & Panasetis, 2005; Fikretoglu et al., 2006). In support of this

hypothesis, Bryant and Panasetis discovered that panic symptoms during a traumatic event accounted for most of the variance of peritraumatic dissociation, suggesting that peritraumatic dissociation is strongly associated with panic symptoms. It is not yet clear from existing research whether peritraumatic dissociation phenomena occur with primarily a defensive purpose, or are merely secondary to the inability to successfully integrate the sensory and physiological components of a very stressful event (a viewpoint that would be more consistent with a Janetian conceptualization of dissociation; Dorahy & van der Hart, 2007).

Post-Traumatic Stress Disorder and Acute Stress Disorder

PTSD is a set of symptoms that develop after a person witnesses or directly experiences an extreme traumatic stressor involving threatened or actual death, serious injury, or sexual violence (APA, 2013). It may also result after learning that a traumatic event has occurred to a friend or family member, or after repeated exposure to aversive details of a traumatic event (such as first responders in a disaster). In order to qualify for the PTSD diagnosis in the *Diagnostic and Statistical Manual of Mental Disorders-V* (APA, 2013), an individual will persistently re-experience the traumatic event (intrusive recollections, nightmares, flashbacks, reactivity at cues of the trauma), demonstrate avoidance of stimuli associated with the trauma (avoidance of distressing thoughts or memories or external reminders), experience negative alterations in cognition and mood associated with the traumatic event (amnesia, enduring negative or distorted beliefs about self and/or others or the causes of the traumatic event, persistent negative emotional state, diminished interest in significant activities, detachment from others, difficulty experiencing positive emotions) and exhibit alterations in arousal or reactivity (difficulty with sleep, irritability or angry outbursts, reckless or self-destructive behavior, impairment of concentration, hypervigilance, or exaggerated startle response). These symptoms must cause clinically

significant impairment and the duration must be greater than one month (APA, 2013). If an individual meets criteria for PTSD and also experiences persistent depersonalization (detached from the self or body) or derealization (detached from the world or surroundings), they meet criteria for a dissociative subtype of PTSD (APA, 2013). PTSD is also associated with other phenomena not included in the DSM-V criteria, including “altered awareness, detachment, dissociative states, ego fragmentation, personality changes, paranoid ideation, trigger events, and vivid intrusive traumatic recollection” (Yeager & Roberts, 2003, p. 9). It is also frequently comorbid with other psychological disorders including depressive disorders, anxiety disorders, and substance abuse (Yeager & Roberts, 2003).

Acute Stress Disorder (ASD), as defined by the DSM-V, is a syndrome following a traumatic stressor described above. It requires the presence of peritraumatic or persisting dissociation (numbing/detachment, reduced awareness of surroundings, derealization, depersonalization, dissociative amnesia), persistent re-experiencing of the traumatic event, avoidance of stimuli that elicit memories of the trauma, recurrent negative mood, and increased autonomic arousal or anxiety (APA, 2013). The symptoms must cause clinically significant impairment and the duration must be between three days and one month (after which the person becomes eligible for a PTSD diagnosis). It is a newer diagnostic category that was introduced in 1994 to differentiate more transient reactions to trauma from extended and chronic post-traumatic symptoms (Yeager & Roberts, 2003). It also developed out of a consideration for the relationship between post-traumatic pathology and dissociative phenomena (Cardeña & Carlson, 2011), and its aim was to distinguish between normal and pathological acute stress responses by associating ASD with development of PTSD (and thus a poorer prognosis; McNally, 2003).

Research on the capacity of ASD to reliably predict PTSD development is variable and inconsistent. In one study that examined the role of an ASD diagnosis as a predictor of subsequent PTSD in victims of physical assault, 89% of the initial ASD cases diagnosed within 1-2 weeks of the assault met criteria for PTSD at six months (Eklit & Brink, 2004). However, Cardeña and Carlson (2011) argue that ASD is not a sensitive predictor of PTSD, as the proportion of those that later develop PTSD from an initial ASD status vary greatly in studies. Further, many individuals who eventually meet criteria for PTSD do not originally fulfill the ASD criteria (Bryant, 2009). The diagnosis is also critiqued on the basis that diagnosing ASD may pathologize normal reactions and evolved mechanisms to extremely stressful events (McNally, 2003), and it makes little sense to distinguish between two diagnoses simply on the basis of symptom duration (Bryant, 2009).

Delayed Post-Traumatic Stress Disorder

It is common for PTSD symptoms to manifest significantly after the traumatic event, a phenomenon called delayed PTSD. In a meta-analysis of delayed onset PTSD, Smid, Mooren, van der Mast, Gersons, and Kleber (2009) reviewed longitudinal studies with a mean duration of 25 months and a maximum range of 60 months and combined study populations, and found that 24.8% of subjects had delayed onset PTSD. The occurrence of delayed PTSD introduces a challenge to developing an aetiological model linking traumatic stress to symptoms, given that symptoms do not immediately follow traumatic stress in these cases. McFarlane (2010) explains the prolonged delay between exposure to the event and onset of symptoms as a process of sensitization. Sensitization results from plasticity of the nervous system and represents the cumulative physiological effect of multiple stressors across a lifespan. It occurs at multiple levels in an individual (cellular, physiological, and interpersonal). Theories of sensitization argue that

repeated exposure to traumatic events, as well as other disorders with similar sensitization-based aetiology (such as Major Depressive Disorder), constitutes the basis for delayed PTSD (McFarlane, 2010). In support of this notion, many studies indicate that previous exposure to trauma yields a greater risk of PTSD (McFarlane, 2010), and participants with initial subthreshold PTSD (indicating physiological “wear and tear”) are at increased risk of developing delayed PTSD (Smid et al., 2009).

Risk Factors for Post-Traumatic Stress Disorder

The typical trajectory of PTSD involves an initial period after the traumatic experience in which a person begins to process and integrate the experience through self-regulation and social support. In certain individuals, the typical symptoms of PTSD begin to register after several weeks (McFarlane, 2000). It is during this transition period that risk factors and protective factors are arguably the most crucial. Prior trauma, psychiatric history, family psychiatric history, peritraumatic dissociation, severity of acute stress symptoms, and the constellation of autonomic hyperarousal and biological response are all relevant to the emergence of PTSD (McFarlane, 2000). When studying risk factors, comorbidity is particularly important to consider, as many people who develop PTSD already have a pre-existing disorder that may have acted as a risk factor (McFarlane, 2000). Studies suggest that the strongest predictor to PTSD is immediate response to trauma, particularly unmanageable peritraumatic terror and horror (Marmar et al., 2006, as cited in Bremner & Vermetten, 2007), prolonged panic, and believing oneself to be in danger during a trauma (McNally, 2003).

Much of the literature discussed in this review will be concerned primarily with risk factors to PTSD symptomatology, especially the presence of dissociation. However, the literature on resilience in response to trauma is worth considering for broadening the understanding the

complex, multifaceted, and dynamic relationship between a traumatic stressor and PTSD symptomatology.

Traumatic Stress and Resilience

Response trajectories after a traumatic stressor can be generally categorized into one of four prototypical patterns: chronic dysfunction, gradual recovery, delayed reactions, and resilience (Bonanno & Mancini, 2012). Although it is often believed that the most common sequela of a traumatic event is the development of post-traumatic stress symptoms, resilience as a response to loss or trauma is more frequent than assumed (Bonanno, 2004). Resilience has been defined as the capacity to adapt relatively well to adversity, and “can make the difference between integration and disintegration for trauma survivors” (Overland, 2011, p. 63).

Research indicates that there are multiple and overlapping contributions to resilience. The trait of hardiness has been linked to resilience in response to trauma (Bonanno, 2004). Hardiness has three components: a sense of control over one’s life, a sense of meaning that gives structure to one’s life, and a perspective of seeing change as a challenge (King, King, Fairbank, Keane, & Adams, 1998). Functional social support serves as another pathway to resilience (King et al., 1998). In a study using structural equation modeling to examine relationships between resilience factors and PTSD in Vietnam veterans, functional social support served as the link between a large amount of the indirect effect of hardiness on the presence of PTSD (King et al., 1998). This suggests that veterans who demonstrate more hardiness may be able to attain a more adaptive support network than those who are lower in hardiness. Other factors that have contributed to resilience include self-enhancement (overly positive self-related biases), repressive coping (tending to avoid unpleasant thoughts, emotions, and memories), and positive emotion and laughter (Bonanno, 2004).

A grounded theory analysis study of survivors of the Khmer Rouge regime found multiple themes for how individuals explained their resilient functioning, including caring for each other, adaptation and understanding the situation, religious worldview, perseveration (trying “again and again”), and self-reliance (Overland, 2011). The idea of social integration and cohesion, mutual support and assistance, and the importance of community was revealed to be a dominant theme in this population. Further, many survivors of the Khmer Rouge regime emphasized the value of personal agency; the resilient “did not lose consciousness of their participation, their responsibility for their lives and destinies,” and “recognized... the world and the self were something they were responsible for, something they were involved in constructing themselves” (Overland, 2011, p. 71).

Considering the rich and complex range of responses to trauma, such as chronic dysfunction, gradual recovery, delayed reactions, and resilience, and the factors contributing to these multiple trajectories is crucial in any study of PTSD and the sequelae of traumatic stress. In the following discussion of the literature, the relationship between PTSD symptomatology and one widely-cited risk factor, peritraumatic dissociation, will be reviewed.

Correlation Between Peritraumatic Dissociation and Posttraumatic Symptoms

It has long been a tenet in the field of dissociation that acute dissociation during the course of a traumatic event is a risk factor for PTSD. Janet (1907, as cited in Bryant, 2009) was one of the earliest theorists trying to explain this relationship by proposing that traumatic experiences that were inconsistent with existing cognitive schema resulted in dissociated awareness of the trauma. He posited that healthy adaptation following trauma requires integrating fragmented memories of the trauma into consciousness. Thus, dissociation during trauma would inhibit the accessibility of the traumatic memory and block emotional processing,

leading to ongoing psychopathology (Bryant, 2009). Similarly, Holmes et al. (2005) propose that the physiological changes associated with detachment during peritraumatic dissociation interfere with encoding the memory, leading to “poorly integrated representations of the traumatic event in the autobiographical memory base” (p. 6). This contributes to the development of intrusive images and flashbacks.

A second prevailing etiological model of the relationship between peritraumatic dissociation and PTSD considers peritraumatic dissociation to be a consequence and epiphenomenon of elevated arousal during a traumatic event (Bryant et al., 2011). In support of this theory, there is evidence that derealization (a type of dissociation) mediates the relationship between panic reactions during trauma and subsequent posttraumatic symptom severity (Bryant et al., 2011). Another theory of the association between peritraumatic dissociation and PTSD is called delayed hyper-reactivity. This refers to a rebound effect of dissociation during acute stress wherein dissociative experiences are associated with intense anxiety but the detachment impairs the conscious link between the sources of anxiety. Thus, the reduced awareness may add intensity to the physiological associations of trauma-related triggers by making them seem more unpredictable and uncontrolled (Ginzburg et al., 2006).

One of the most compelling indications of the correlation between peritraumatic dissociation and PTSD symptom severity comes from a meta-analysis of 68 studies analyzing predictors of PTSD. Ozer, Best, Lipsey, and Weiss (2008) found that of seven possible predictors of PTSD symptom severity or rate, peritraumatic dissociation was the most robust factor contributing to the prediction of PTSD symptoms. Peritraumatic dissociation overall had an effect size of .35, and in the individual studies, the effect sizes ranged from .14 to .94 (Ozer et al., 2008). Other meta-analyses found a significant positive relationship between peritraumatic

dissociation and posttraumatic stress; one analysis found a standardized correlation across studies of .401 (a medium effect size; Lensvelt-Mulders, van der Hart, van Ochten, van Son, Steele, & Breeman, 2008), and another analysis found an effect size of .36 (Breh & Seidler, 2007). In a study of war stress exposure and posttraumatic symptoms, Marmar et al. (1994) discovered that peritraumatic dissociation is strongly and incrementally associated with severity of posttraumatic stress. Peritraumatic dissociation was more contributory to level of war stress exposure or general dissociative tendencies in accounting for PTSD. Further, there is evidence that the association between peritraumatic dissociation and subsequent PTSD is at least in part independent of pre-existing (generalized) dissociative traits (Murray, Ehlers, & Mayou, 2002).

Further supporting the link between peritraumatic dissociation and posttraumatic symptoms, Van der Hart, van Ochten, van Son, Steele, and Lensvelt-Mulders (2008) conducted a review of 53 empirical studies and discovered a generally positive association between peritraumatic dissociation and PTSD (34 out of 53 studies supported this relationship). The review found that nine studies demonstrated a nonsignificant relationship between these variables, and 10 studies provided evidence that the relationship remained unclear or differed over time (Van der Hart et al., 2008). The population under study seemed to affect the nature of the discovered relationship: medical studies were more likely than community samples to find either a positive or nonsignificant correlation between peritraumatic dissociation and posttraumatic symptomatology than a negative one.

A significant body of evidence, however, persists in discounting the relationship between peritraumatic dissociation and posttraumatic symptoms. These empirical studies either fail to replicate this relationship, conclude insufficient evidence for the independent predictive value of peritraumatic dissociation for PTSD, or find that the relationship disappears after other variables

are statistically controlled for (Marshall & Schell, 2002; Marx & Sloan, 2000, as cited in Van der Hart, et al., 2008; van der Velden et al., 2006). Several studies have found persisting dissociation to be more highly correlated with PTSD than peritraumatic dissociation. Panasetis and Bryant (2003) report that acute peritraumatic dissociation had a correlation of 0.38 with scores on the Acute Stress Disorder Structured Interview (ASDI), whereas persistent dissociation had a correlation of .77 with the ASDI. Van der Hart et al. (2008) suggests that current research on peritraumatic dissociation is limited by variable methodology, study design, sampling, measurement, control for moderating and mediating variables, and nonspecific time parameters for defining peritraumatic dissociation. In a critique of the Ozer et al. (2008) meta-analysis, Breh and Seidler (2007) argue that the meta-analysis did not distinguish between retrospective and prospective study designs, making the only possible conclusion that peritraumatic dissociation is a correlate of posttraumatic symptomatology, not a predictor. In addition, baseline PTSD symptom severity may serve as the true independent variable for subsequent PTSD symptom severity. Marshall and Schell (2002) found that baseline recollections of peritraumatic dissociation collected within a few days of a traumatic event were not predictive of subsequent PTSD symptom severity after statistically controlling for baseline PTSD symptoms measured within days of a traumatic event.

The degree to which peritraumatic dissociation is an independent predictor of PTSD symptoms severity, rather than interacting with other predictor variables, has been insufficiently studied (Bryant, Brooks, Silove, Creamer, O'Donnell, & McFarlane., 2011). Current meta-analyses concluding that peritraumatic dissociation is a predictor of posttraumatic stress, including the meta-analysis conducted by Ozer et al., did not examine either the independent predictive value of peritraumatic dissociation or the predictive value of initial mental health

problems following traumatic events (van der Velden & Wittman, 2008). In a systematic review of prospective studies examining the independent predictive value of peritraumatic dissociation for PTSD following single traumatic events, the majority of the 17 identified studies showed no or only weak evidence for independent predictive value (van der Velden & Wittman, 2008).

These authors considered mental health problems to be a better predictor overall, and concluded that even in studies in which peritraumatic dissociation is a strong predictor for PTSD symptom severity, it is not clear how much of this predictive value is independent of other risk factors.

There are several possible reasons for the unclear relationship between peritraumatic dissociation and posttraumatic stress symptoms. It is possible that it is a diathesis-stress relationship, making posttraumatic stress symptoms more likely to occur in individuals that are biologically inclined or are predisposed for dissociative experiences (Bryant, 2009), such as persons with high capacity for absorption (Dalenberg & Paulson, 2009). Other potential explanations are that dissociation could be associated with other known risk factors for PTSD (such as a history of childhood trauma); that peritraumatic dissociation could be associated with hyperarousal immediately following trauma (which directly contributes to PTSD development); or that the appraisal (rather than the presence) of peritraumatic dissociation may influence the subsequent development of PTSD (Bryant, 2009). Dissociation may also co-occur with either autonomic arousal and emotional stress. Depending on the relationship between these predictors and PTSD (for example, PTSD possibly occurring only in those who were aroused but not distressed, while dissociation could occur in individuals experiencing both), dissociation may not emerge as a consistent predictor of PTSD (Waelde, Silvern, Carlson, Fairbank, & Kletter, 2009).

Cardena and Carlson (2011) discuss several possible mediating factors for the relationship between dissociation and PTSD, including the quality of attachment to the caregiver

during development, coping style, and ability to mentalize (ability to reflect on the mental states of self and others). These authors suggest researching more specifically “what type of dissociative symptom... for what person, in what type of trauma, and for what duration... and one might also analyze the possible temporal sequence of symptoms during short intervals of time” (Cardena & Carlson, 2011, p. 256). One of the most commonly posited explanations for the inconsistent correlation between peritraumatic dissociation and PTSD is the use of methodologies that do not distinguish between dissociative responses during trauma or persisting dissociation post-trauma that inhibits the assimilation of traumatic experience (Dell, 2009b; Bryant, 2009).

Contribution of Persisting Dissociation to Posttraumatic Symptoms

As cited earlier, there is a growing body of evidence indicating that persisting dissociation following trauma may be more strongly associated with posttraumatic stress symptoms than peritraumatic dissociation (Halligan et al., 2003; Van der Hart et al., 2008). Thus, many individuals are able to integrate trauma memories after peritraumatic dissociation, while ongoing dissociation impedes access to and processing of experiences. The position of Van der Hart, Nijenhuis, and Steele (2006) on trauma integration is consistent with Pierre Janet’s theory that integration necessitates the dual capacity for synthesis and realization. With synthesis, the trauma survivor can link, bind (various aspects of the memory into a smooth whole), and differentiate relevant and irrelevant components of his or her experience in order to function adaptively. Realization involves meaning making and the creation of a continuous narrative of self and experience over time. Integration of a memory of trauma, according to these authors, involves both synthesis and realization (Van der Hart et al., 2006). It can be argued that persisting dissociation inhibits the ability to synthesize the memory and to place it in a cohesive

autobiographical narrative.

In another argument for the contribution of persisting dissociation to posttraumatic symptoms, Foa hypothesizes that following trauma, mental representations of the traumatic experience become developed in the context of fear structures, which are cognitive representations of the traumatic experience that contain excessive threat-related beliefs (Foa & Kozak, 1986, as cited in Bryant, 2007). Foa posits that recovery from a trauma requires activation of the fear structures (Foa & Hearst-Ikeda, 1996, as cited in Bryant, 2007). In this theory, persisting dissociation leads to psychopathology because ongoing dissociation impairs the necessary activation and processing of trauma-related fear structures (Bryant, 2009). In support of the relationship between persistent dissociation and PTSD, Panasetis and Bryant (2003) found that persistent dissociation at the time of testing was more strongly associated with severity of Acute Stress Disorder (ASD) symptoms and intrusive symptoms than was peritraumatic dissociation measured retrospectively. Another study found that persisting dissociation accounted for 34.8% of the variance of a PTSD diagnosis, whereas peritraumatic dissociation only accounted for 15.2% of the variance (Briere, Catherine, & Weathers, 2005). In a prospective study with road traffic accident survivors, persistent dissociation four weeks after the accident was the most robust predictor of chronic PTSD symptom severity six months post-trauma (Murray, Ehlers, & Mayou, 2002). It is possible that at least some kinds of acute dissociative responses are nonspecific reactions to trauma, and continued dissociation in response to subsequent stressors is the best predictor of long-term psychopathology (Bremner & Vermetten, 2007).

Research conducted on persisting dissociation indicates varying and broad time ranges by which persisting dissociation is defined. In a review of 53 empirical studies, the interval for

persisting dissociation ranged from the first 24 hours to 20 years following a traumatic event (Van der Hart et al., 2008). Panasetis and Bryant (2003) note in their study that this wide time range may be a potential confounder to more specific measurements of dissociation during sensitive periods post-trauma. Panasetis and Bryant defined persistent dissociation as any indication of dissociation that is phenomenologically similar to peritraumatic dissociation occurring between 2 and 28 days following trauma.

Taxonomies of Dissociative Experiences

In the current literature on dissociation, researchers have noted that dissociation has been used as an all-encompassing term (known as the unitary model). This model describes symptoms of neurologically and phenomenologically disparate experiences, such as depersonalization, derealization, amnesia, emotional numbing, and flashbacks (Holmes et al., 2005). However, studies suggest that dissociation is empirically comprised of distinct constructs. Some researchers advocate for differentiating dissociative experience along the lines of pathology versus normality. In this view, pathological dissociation is taxonic and related to trauma, and normal dissociation is mild, common, temporarily, and minimally associated with pathology (Dalenberg & Paulson, 2009).

Other researchers cite factor analyses of dissociation measurements as evidence for distinct types of dissociation. For example, Briere, Weathers, and Runtz (2005, as cited in Dell & Lawson, 2009) argued for the multifactorial nature of dissociation based on their factor analysis of the Multiscale Dissociation Inventory. They found five factors (disengagement, identity dissociation, emotional constriction, memory disturbance, and depersonalization-derealization) to be so weakly correlated with one another (mean r of factor scores was 0.39), that the “empirical coherence of the construct of dissociation is called into question” (Dell & Lawson,

2009, p. 668). At least 14 factor analyses determine the widely-researched Dissociative Experiences Scale (DES) to be multifactorial (Dell & Lawson, 2009), with many studies finding it comprised of three separate factors: absorption, depersonalization-derealization, and amnesia (Brown, 2006). Taxometric analyses have repeatedly concluded that there is a typological difference between amnesia and depersonalization/derealization (where only certain people experience this and others do not) and absorption (all individuals experience this on a continuum; Dell & Lawson, 2009). Brown argues that the absorption factor from factor analyses is misleading because of the differing base rate of absorption, as it is a common and nonpathological phenomenon (although in a clinical population, elevated DES absorption scores seem to indicate significant pathology; Allen et al., 2002). The distinction between depersonalization-derealization and amnesia reflects a common taxonomy that differentiates compartmentalization and detachment types of dissociation (Holmes et al., 2005).

Holmes et al. (2005) note that many authors of dissociation literature seem to converge on a taxonomy of dissociation that involves two distinct phenomena. Cardeña (1994), Holmes et al. (2005), and Brown (2006) all explicate a distinction between two types of dissociation: detachment and compartmentalization (Nijenhuis & Van der Hart, 2011). As previously mentioned, Steele et al. (2009) advocate for the notion of preserving the term dissociation to solely reflect structural dissociation, while denying that experiences involving alterations of consciousness are a type of dissociation. Cardeña, who originally developed the concept of detachment and compartmentalization, described three broad categories of dissociation: (a) dissociation as non-integrated mental systems, (b) dissociation as a disconnection from the self or the world, and (c) dissociation as a defense mechanism (Cardeña, 1994, as cited in Holmes et al., 2005). Holmes et al. argue that the third category represents the function of the first two

categories, leaving a fundamental distinction between compartmentalization and detachment.

Detachment. Detachment is defined as an altered state of consciousness involving a sense of separation or detachment from everyday experiences of the self or the world (Brown, 2006). Steele et al. (2009) note that detachment can also be conceptualized through the Janetian lens of retracted field and low level of consciousness. A factor analysis of the DES yielded two dimensions of detachment: detachment from one's actions (feeling out of touch with what one is doing or has done) and detachment from the self and environment (detached from one's body, identity, and the external world; Allen, Coyne, & Console, 1997). Cardeña reserves the term detachment to describe "qualitative departures from one's ordinary mode of experiencing" that involve an unusual degree of disengagement, rather than ordinary absorption or less-than-ideal engagement with the environment or one's actions (Nijenhuis & Van der Hart, 2011, p. 434). Detachment occurs as an experiential byproduct of top-down (frontal cortices) inhibition of limbic circuits implicated in emotions (amygdala and anterior cingulate cortex), combined with a parallel activation of the right prefrontal cortex and corresponding attentional systems (Sierra & Berrios, 1998). This reciprocal inhibition and activation elicits the experience of vigilant alertness, a broad focus of attention, and emotional constriction (Holmes et al., 2005). Detachment has been compared in the literature to the typical experiences of peritraumatic dissociation, particularly evolutionary-prepared dissociation (Brown, 2006; Nijenhuis & Van der Hart, 2011).

Compartmentalization. Holmes et al. (2005) describe four aspects of compartmentalization dissociation, which closely follows Cardeña's definition:

1. It involves a deficit in the ability to control processes or actions that usually can be controlled.

2. It cannot be overcome or eliminated by will.
3. The deficit in ability is theoretically reversible.
4. It can be demonstrated that the seemingly disrupted processes actually operate normally and are able to affect cognition, emotion, and action.

This type of dissociation describes types of dissociative amnesia, Dissociative Identity Disorder, and other physical symptoms typical in somatoform dissociation (Brown, 2006). A possible explanation of the etiological basis of compartmentalization involves the inability to reduce discrepancies between basic behavioral goals (such as attachment vs. fear of abandonment) in traumatic environments. A mechanism to reduce the dissonance produced by incompatible motivational systems would be to prevent their simultaneous activation, wherein separate goal hierarchies develop and become elaborated over time and repetition (Brown, 2006).

Brown (2006) posits a description of compartmentalization that includes the notion that “made” actions (actions that the individual does not feel he or she is controlling), which was previously subsumed by Holmes et al. (2005) under the category detachment as a phenomenon of depersonalization. This model is more closely aligned to the theory of structural dissociation proposed by Nijenhuis and Van der Hart, and is congruent with empirical evidence demonstrating that “made actions” typically occur in the context of compartmentalization (Dell, 2009b). Nijenhuis and Van der Hart (2011) offer a critique that the Holmes et al. (2005) and Brown (2006) model of compartmentalization of process lacks specificity. Although compartmentalization of experience is more compatible with their notion of structural dissociation, Nijenhuis and Van der Hart argue that psychobiological profiles are compartmentalized in addition to experience.

From the existing literature, it is unclear whether there is a typical timeline of detachment

and compartmentalization types of dissociation after a traumatic event. Given that detachment dissociation is typically compared to peritraumatic dissociation, it is possible that peritraumatic dissociation is more consistent with a neurobiological and phenomenological profile associated with detachment, while persisting dissociation may be more closely related to compartmentalization. Differentiating between detachment or compartmentalization when measuring peritraumatic or persisting dissociative experiences may clarify the kinds of situations (such as time since the trauma) most likely to elicit divergent types of dissociative experience.

The way that dissociation is researched often reflects the vague and imprecise understanding of dissociation that is present in academic and clinical communities. Further, the conclusions that we can draw from studies on the subject of dissociation can only be meaningful or accurate when our definitions of dissociation are clearly demarcated and our methods of measurement and analysis are appropriate. Our understandings of dissociation are defined and limited by the way that dissociation is assessed. Thus, it is pertinent to discuss the limitations of methods and measurement that have been identified as themes in the study of dissociation.

Methodological and Measurement Limitations in Current Research

Methodological flaws or oversights in current dissociation literature reviewed here aim to inform the appropriate methodology of the research design.

Operationalization. In a critical review of 53 empirical studies on the relationship between peritraumatic dissociation and PTSD, Van der Hart et al. (2008) determined that a methodological flaw common across all the studies was the unclear conceptual base of the peritraumatic dissociation construct and the lack of a consistent operationalization of peritraumatic dissociation across measurement instruments. This created ambiguity about the phenomena the instruments were actually measuring, and reflects the lack of clarity regarding the

concept of dissociation itself. It is critical that any effort to investigate the construct of dissociation itself, rather than simply the factor-structure of a particular measure of dissociation, must use a measure that fully encompasses the entire domain of dissociative phenomena (Dell & Lawson, 2009). This includes incorporating measures of peritraumatic somatoform dissociation (Lensvelt-Mulders et al., 2008), which is often neglected in current research on the link between peritraumatic dissociation and subsequent PTSD symptom severity.

Distinguishing between peritraumatic and persisting dissociation. Van der Hart et al. (2008) also determined that the majority of empirical studies did not measure the extent to which peritraumatic dissociation persisted over time, making it difficult to discern whether persisting dissociation may have accounted for more of the variability in posttraumatic symptomatology than did peritraumatic dissociation. These authors recommend that future studies of the link between peritraumatic dissociation and PTSD include measures of trauma-related persistent dissociation that is still occurring at the time of testing (such as the Dissociative Experience Scale—Taxon, Multidimensional Inventory of Dissociation, or Somatoform Dissociation Questionnaire).

Limitations of dissociation measures. Our current measures of dissociation do not adequately distinguish the mechanism or bases of aspects of alterations of consciousness. For example, Steele et al. (2009) argue that the instruments typically used (such as the PDEQ and DES) assess a mixture of both alterations of consciousness and structural dissociation without making a distinction between these. This is of critical importance to these authors, as they claim that experiences that do not derive from structural division of the personality should not be assigned the label of dissociation. Structural dissociation engenders a sense of self that is fundamentally fragmented and inconsistent, while it is generally unitary (if temporarily

suspended) in other kinds of alterations of consciousness (Steele et al., 2009). This differentiation is made difficult because severe absorption associated with alterations of consciousness can cause both the detachment symptoms and memory gaps that are also seen with structural dissociation, despite the discrepant bases of action involved (Dell, 2009b).

In a similar vein, current measures cannot distinguish between two types of memory gap: dissociative amnesia and lack of encoding based memory gaps (Dell, 2009b). Dissociative amnesia is reversible and often occurs in the context of automatisms or dissociated structures (encoding of experience in altered states; Allen, Console, & Lewis, 1999). The other type of memory gap is irreversible (Allen et al., 1999), a function of extreme detachment and reduced awareness of surroundings, and due to a deficit in encoding and storage of information (Bryant, 2009). A certain degree of elaborative encoding is needed to build enduring autobiographical memory, and without this encoding, one cannot retrieve life events from memory (Allen et al., 1999). The amnesia that follows a trauma or hypnotic trance state in which limited encoding took place is fundamentally different from the dissociative amnesia that occurs as a result of structural dissociation (Butler et al., 1996; Steele et al., 2009). Thus, the fact that current measures do not adequately distinguish between types of trauma-associated encoding deficits and dissociative amnesia perpetuates the problems associated with the vague and inconsistent operationalization of dissociation.

Measurement of confounding variables. Van der Hart et al. (2008) also concluded that other factors besides persistent dissociation may have influenced or accounted for the relationship between peritraumatic dissociation and PTSD. Many studies do not include the measurement of potential confounding variables, such as personality traits and general psychopathology (neuroticism/psychoticism scales; Candell & Merckelbach, 2004), peritraumatic

distress, interpretations of traumatic memories, subjective significance of the trauma (Beere, 2009) or initial PTSD symptom severity in the case of longitudinal studies (Van der Hart et al., 2008).

Retrospective overendorsement. Many studies first ask participants about symptoms and then to rate their peritraumatic dissociation (Candel & Merckelbach, 2004). This order risks evoking the attribution that severe consequences (symptoms) must have intense causes (reactions during the event), risking retrospective overendorsement of peritraumatic dissociation. Future studies of peritraumatic dissociation and PTSD should inquire about aspects of peritraumatic dissociation prior to PTSD symptoms in order to minimize confounding the ratings of peritraumatic dissociation. Although this ordering risks overendorsement of PTSD symptoms, it is likely to pose less of a danger of distorting measurement of peritraumatic dissociation, which is the primary area of focus in this research proposal.

Limitations of Retrospective Reporting

Although research involving trauma and peritraumatic dissociation relies heavily on retrospective reporting, there is conflict regarding the reliability of retrospective self-reports (Bryant, 2007; Candel & Merckelbach, 2004; Marshall & Schell, 2002). In a longitudinal study with survivors of community violence, it was found that changes in PTSD symptoms over time were correlated with changes in memories of peritraumatic dissociation. Subsequent memory for peritraumatic dissociation measured at 3 and 12 months following the initial interview did not match recollections collected within days of the traumatic incident (Marshall & Schell, 2002). These authors argue that data drawn from retrospective reporting can only provide suggestive evidence of a causal connection between peritraumatic dissociation and posttraumatic symptomatology, as retrospective data are vulnerable to recall and reporting biases.

Retrospectively gathered data may be inaccurate as a result of the difficulty inherent in giving accurate descriptions of previously experienced affective states, either due to forgetting, attribution biases, or malingering (Candel & Merckelbach, 2004). Further, Bryant (2007) argues that retrospective memory of reactions to trauma may be influenced by current psychological state.

In a critical review of articles involving peritraumatic dissociation research, however, Van der Hart et al. (2008) noted that results from prospective longitudinal studies of peritraumatic dissociation converged with results from retrospective studies. In addition, Marmar et al. (1999, as cited in Nijenhuis et al., 2001) conducted a longitudinal study of posttraumatic stress and found that reports of peritraumatic dissociation were stable over time. In further defense of the reliability of retrospective reporting, a meta-analysis of studies examining the link between peritraumatic dissociation and PTSD symptom severity suggests that retrospective reports of peritraumatic dissociation seem to be stable over time (Lensvelt-Mulders et al., 2008). Contrary to the notion of retrospective overendorsement, it was found in this meta-analysis that prospective/longitudinal studies actually yielded a stronger relationship between peritraumatic dissociation and posttraumatic stress than retrospective studies. They also found roughly equivalent results regarding the peritraumatic dissociation and posttraumatic stress link between quasi-prospective and retrospective designs in the meta-analysis by Breh and Seidler (2007). Thus, Lensvelt-Mulders et al. argue that a positive relationship between peritraumatic dissociation and posttraumatic symptoms is not merely an artifact of biased retrospective report. Regardless, conclusions drawn from the retrospectively-collected data in this study should be interpreted with a degree of caution given the concerns about the validity of data collected retrospectively. Further, retrospective studies can only determine whether peritraumatic

dissociation is a correlate of PTSD; to support the conclusion that peritraumatic dissociation is a risk factor, a quasi-prospective research design would be necessary (Lensvelt-Mulders et al., 2008)

In designing a study to determine the factor structure of measures of peritraumatic dissociation and clusters of experience, it is necessary to review the literature conceptualizing peritraumatic dissociation as underlying defensive subsystems. This literature also informs a theory in chapter 3 that describes and differentiates these peritraumatic dissociation clusters.

Peritraumatic Dissociation and Potential Underlying Defensive Subsystems

Dissociation is commonly used as a broad construct that incorporates many different cognitive and phenomenological phenotypes, both similar and sometimes contradictory (Dell, 2009b). Different mechanisms may underlie various types of dissociative experiences—for example, the contrasting phenomenology of alterations in thought process and sensory experience garnered from interviews with persons exposed to life-threatening danger (Noyes & Kletti, 1977). Dell theorizes that dissociation itself is not a behavioral system, but instead is a neurophysiological module that manifests in different defensive behavior systems (Dell, 2009b). Defensive and recuperative actions occur in the context of a multifaceted system comprised of a number of biological substrates that evoke different behavioral and physiological reactions (Nijenhuis, Vanderlinden, & Spinhoven, 1998). These become variably activated depending on the degree of predatory threat. Animals do not respond to aversive stimuli with a single type of behavior or physiological state; instead, qualitatively different and mutually inhibitive action tendencies are evolutionarily designed to optimize chances of survival in successive stages of threat proximity. Stages of threat imminence include pre-encounter defense, post-encounter defense (including freezing, flight, and fight), circa-strike defensive (analgesia, emotional

numbing, and the startle response), and post-strike recuperative subsystems (Nijenhuis et al., 1998). These defensive mobilizations are not single responses, but integrated behavioral and physiological systems.

Clinical dissociation, which involves more evolved neurological systems and has more to do with psychic relief/analgesia than physical survival, cannot be understood without first examining the alterations of consciousness that occur as adaptive responses in threat processing. Clearly, these adaptive responses are not integrated into a unitary biological response system, but rather are integrated subsystems depending on the nature and proximity of an aversive stimulus. Thus, peritraumatic dissociation should be considered in the context of potential component systems that constitute features of its phenomenological experience. Peritraumatic dissociation, as it has been defined and measured, may be a uselessly broad and overarching construct that includes multiple and potentially contradictory neuroanatomical and neurochemical circuits. A more nuanced conceptualization of the biological components of peritraumatic dissociation may be useful in understanding the contradictory findings regarding the nature of the link between peritraumatic dissociation and posttraumatic symptomatology. Dell (2011) suggests that at least three different neurobiological groupings may occur as either peritraumatic or persisting dissociative experiences: evolution-prepared dissociation, tonic immobility, and clinical dissociation.

Evolution-prepared dissociation and tonic immobility are implicated in an organization of biological processing and experiencing that represent integrated defensive subsystems. In contrast to these clusters is the construct that Dell (2011) labels clinical dissociation. Dell proposes that clinical dissociation follows evolutionary-prepared peritraumatic dissociation, and is often experienced as persisting post-trauma dissociation (P. Dell, personal communication,

February 7, 2012). However, he acknowledges the lack of clarity regarding the relationship between trauma and clinical dissociation, and posits that many practitioners believe that clinical dissociation can occur peritraumatically, particularly in patients who have already developed complex PTSD and/or a dissociative disorder (P. Dell, personal communication, February 7, 2012), and that this experience may represent a distinct neurobiological profile of peritraumatic dissociation. The lack of differentiation between peritraumatic and persisting dissociation has engendered vague conceptualization regarding the role of clinical dissociation in the sequelae of trauma. This dissertation asserts that evolution-prepared dissociation, tonic immobility, and clinical dissociation can all be experienced peritraumatically but involve different phenomenology and mechanisms.

Summary

The broad topics covered in the review of the literature are relevant to the theoretical assumptions and conceptualizations of dissociation (including peritraumatic dissociation), the measurement and research of dissociation, and the relationship between PTSD and peritraumatic dissociation. In the context of pertinent literature on definitions of dissociation, it was necessary to detail historical tensions between Janet and Freud, which manifest in current underlying assumptions about dissociation. The competing dimensional and structural/taxonomy models of dissociation were also presented to inform the way that dissociation is defined in the literature. Hypnotic susceptibility and absorption as related fields that have historically intersected with the study of dissociation were also reviewed, as these areas of research are germane to the proposed cluster of clinical peritraumatic dissociation. Further, given the complexity of posttraumatic sequelae and the potential association to peritraumatic dissociation, it was relevant to cover PTSD trajectories and risk factors, including delayed PTSD and resilience, in addition to the

contradictory research on the correlation between PTSD and peritraumatic dissociation.

Further, this section described issues related to the research and measurement of peritraumatic dissociation in order to review literature pertinent to designing the quantitative research study evaluating groupings of peritraumatic dissociation. Thus, methodological and measurement limitations in the current research of peritraumatic dissociation and limitations of retrospective reporting in dissociation research were both reviewed.

Finally, a brief overview of biological defensive subsystems was presented to introduce and transition into the notion of peritraumatic dissociation mapping onto discrete defensive systems with differing physiological and phenomenological correlates. This notion of peritraumatic dissociation will be significantly elaborated in the theory detailed in the next chapter.

Chapter 3: Theory of Peritraumatic Dissociation Clusters

Overview of Theory

The clusters of peritraumatic dissociation presented in this theory are distinguishable by their purpose of either biological survival or psychic relief/analgesia. These clusters include (a) evolution-prepared dissociation, (b) tonic immobility (both responses designed to ensure biological survival), and (c) clinical dissociation (a variant of absorption and/or hypnosis that has been hijacked to alleviate overwhelming psychological stress or pain). These three clusters will be differentiated along the lines of phenomenology (how the particular cluster is experienced by the individual), neurobiological mechanism, and evolutionary or adaptive purpose. Evidence delineating these differentiating characteristics of the clusters will be submitted to argue that these clusters represent distinct responses to trauma. These disparate peritraumatic responses are suspected to occur differentially based on certain factors inherent in the individual and the traumatic experience. The responses are also proposed to carry different correlation strengths to the posttraumatic sequelae of persisting dissociation, PTSD, and the dissociative subtype of PTSD.

Cluster Definitions and Characteristics

Evolution-prepared dissociation. The central component of evolution-prepared dissociation is that it causes alterations of consciousness that increase the awareness of the external environment. This allows the organism to respond rapidly in order to maximize the chance of survival. Thus, evolution-prepared dissociation is the organizing set of systems underlying experiences involving time slowing, calmness of mind, the absence of distracting fear, hyperfocused attention, rapid thinking process, mental clarity, increased ability to problem-solve, and defensive anesthesia (Dell, 2009b). Dell (2009b) summarizes six

assumptions about peritraumatic dissociation in the context of evolution-prepared defense:

1. It is about danger, threat, and survival.
2. It is automatic and immediate.
3. It occurs as one element of an organized defensive response.
4. The specific threat determines its behavioral and physiological manifestations.
5. It is a brief, time-limited experience.
6. Its biological substrate is subcortical.

Animal defensive states and recuperative states corresponding with stages of imminence of a predator have been compared to unintegrated major dissociative states (Nijenhuis et al., 1998). Biological associations with evolution-prepared defenses are more often studied in animals than in humans. There has also been little research that differentiates between evolution-prepared dissociation and other kinds of dissociation, or that examines the sequelae of posttraumatic effects after experiencing exclusively evolution-prepared dissociation.

Tonic immobility. Tonic immobility occurs in a variety of species as part of the package of evolution-prepared defenses when escape is no longer possible from a threat and fighting is unsuccessful. When an animal is unable to escape after a period of active struggling, a dramatic shift in its biological processing occurs and it becomes completely paralyzed, or quiescent (Ratner, 1967). This freezing during circa-strike is associated with decreased arousal, numbing and analgesia, and relinquishment of biological functioning to lower-order survival strategies rooted in increased pain tolerance (Frewen & Lanius, 2006). This passive behavioral response is a last-ditch attempt at survival from a predator after the initial series of defensive responses (Lima et al., 2010). This defensive response, known as tonic immobility or “rape-induced paralysis” (Suarez & Gallup, 1979), is accompanied by a shift in organization from the

dorsolateral PAG to the ventrolateral PAG, producing bradycardia, hypotension, analgesia, and hyporeactivity (Depaulis, Keay & Bandler, 1994). Immobility describes the reduced behavioral output in response to stimuli, and occurs in a variety of organisms, including invertebrates. It has been known by a variety of names in the literature, including death feigning, letisimulation, *totstellung*, reflex immobilization, immobility reaction, and animal hypnosis (Ratner, 1977).

Tonic immobility may be a version of somatoform dissociative reactions that Nijenhuis, van Engen, Kusters, and Van der Hart (2001) propose occur in the context of life threat. According to this model, threat to bodily integrity will produce biologically-based defense somatoform dissociative reactions such as motor and vocal inhibition, anesthesia of perceptual modalities, analgesia, visual distortions (tunnel vision) and numbing. Nijenhuis et al. (2001) found that reported childhood physical abuse predicted peritraumatic somatoform dissociation over and above childhood sexual abuse, supporting their notion of association between these experiences and threat to physical bodily integrity. They also noted that peritraumatic psychological dissociation was more highly correlated with intermediate levels of childhood sexual abuse severity, while peritraumatic somatoform dissociation occurred at a trend level with very severe childhood sexual abuse.

While it is true that tonic immobility is an evolution-prepared defense system, it is likely that it will emerge as a distinct factor from evolution-prepared dissociation when subjected to analysis. One reason for this distinction is the differing neurobiological substrates that underlie more active defensive subsystems and tonic immobility. However, subjective experiences of tonic immobility also seem potentially to overlap and correlate with other kinds of peritraumatic dissociation (such as numbness or detachment from the self), which has caused some theorists to question which markers are shared and which are unique for each construct (Heidt, Marx, &

Forsyth, 2005; Zoellner, 2008). Peritraumatic dissociation scores accounted for 51% of the variance in tonic immobility scores in one study, suggesting that tonic immobility may represent an “extreme behavioral expression of trauma-induced peritraumatic dissociation” (Abrams et al., 2009, p. 550). Zoellner (2008) hypothesizes that a distinction between tonic immobility and peritraumatic dissociation may lie in contrasting cognitive processing. It is possible that peritraumatic dissociation disrupts event-related memory, while memory is either unchanged or enhanced after a tonic immobility response.

Clinical dissociation. The critical distinction between evolution-prepared defenses and clinical dissociation is that clinical dissociation *reduces* awareness of the surroundings (Dell, 2010b). In this way, clinical dissociation is not part of the sequence of biological threat processing that enhances the perception of external stimuli in order to maximize the chances of survival when encountering a predator. Clinical dissociation is expected to be the basis of peritraumatic reactions such as reduced awareness of or detachment from surroundings, impaired concentration, and a general feeling of mental foggy. Although there is limited empirical evidence that clinical dissociation happens at the time of a traumatic event (rather than as a pattern of habitual persisting dissociation), there exists much clinical evidence that these states do occur peritraumatically.

Clinical dissociation appears to have phenomenological characteristics in common with detached absorption and with self-hypnosis, which entails entirely different mechanisms than the evolutionary-derived dissociative responses described above. These are peritraumatic states in which there is intense absorption in certain hypnotic experiences (imagery, a detached absorption “void,” etc.) that occur in the context of disconnection/dissociation from other aspects of experience (Vermetten & Spiegel, 2007). This results in the peritraumatic experiences of

analgesia, numbing, and visual and temporal distortions. Particularly implicated in the child abuse literature, it has been documented that many individuals seem to spontaneously enter trance-like states in self-regulatory attempts to alleviate the effects of inescapable and unpredictable trauma (Bliss, 1984). Dell (2009b) believes that this kind of dissociation in response to external events occurs (particularly in childhood) when someone possesses high hypnotizability, routinely encounters painful situations, and is able to spontaneously mobilize their hypnotic/dissociative ability to “escape” these situations. This clinical dissociation also appears to be related to absorption, as individuals who experienced temporary altered states of consciousness in the Adult Attachment Interview also had significantly elevated absorptive capacities in comparison with other subjects (Hesse & Van Ijzendoorn, 1999).

Phenomenological Differences

Evolution-prepared dissociation. As previously mentioned, the primary subjective experiences that originate in evolution-prepared dissociation include time slowing, calmness of mind, emotional numbing, hyperfocused attention, rapid thinking, mental clarity, and anesthesia (Dell, 2009b). Immediately life-threatening events that are about biological threat and require defensive systems geared toward survival would elicit these kinds of responses. Noyes and Slymen (1978–79) found in a factor analysis of questionnaire responses from victims of life-threatening accidents (including falls, drowning, automobile accidents, miscellaneous accidents and serious illness) that there were three factors of experience during these traumatic events: depersonalization, hyperalertness, and mystical consciousness. Hyperalertness (rapid thinking, mental clarity, thoughts being sharp or vivid, enhanced ability to problem solve) was reported most frequently (59% of participants), followed by depersonalization (39%), and finally mysticism (24%).

Interestingly, the depersonalization that characterizes the experience during life-threatening events is phenomenologically distinct from persisting depersonalization in psychiatric illness. Although the syndrome seems to be similar between these populations (involving a feeling of strangeness or unreality, dampening of emotions, an altered perception of time and space, altered sensation), mental clouding is more prominent with psychiatric illness and hyperalertness is more common in accident victims during a life-threatening event (Noyes, Hoenk, Kuperman, & Slymen, 1977). It seems that the depersonalization associated with life-threatening trauma has stimulating effects associated with intense vitality, whereas depersonalization in chronic dissociative or other psychiatric disorders is more prone to cause someone to feel empty and lifeless (Noyes et al., 1977).

Tonic immobility. Tonic immobility is a circa-strike freezing response in which all previous defensive maneuvers have proved ineffective. Although it is as evolutionarily-derived as evolution-prepared dissociation, it possesses a distinct phenomenological and neurobiological profile.

Tonic immobility has a long history of study with animal subjects, but human analogues have been documented in response to a wide variety of threats, including attacks by wild animals, rape-induced paralysis, and aircraft disasters (Gallup & Rager, 1996). In humans, tonic immobility includes (a) motor inhibition, (b) fixed or unfocused eye gaze, (c) Parkinson-like tremors in extremities, (d) suppressed ability to speak, (e) analgesia, (f) increased respiration, and (g) reduced core body temperature (Marx et al., 2008). Tonic immobility induced by reading trauma scripts is associated with a restricted area of body sway, accelerated heart rate, and diminished heart rate variability (Volchan et al., 2011). There is conflicting information regarding whether bradycardia or tachycardia accompany tonic immobility; Volchan et al. write that

freezing in response to low level threats is accompanied by bradycardia, while reliving a traumatic experience is associated with tachycardia. This fear bradycardia drops the heart rate to 25–90% of its baseline, as opposed to the bradycardia associated with the orienting reflex (3 – 15% of baseline; Öhman, Hamm, & Hugdahl, 2000).

Although research on tonic immobility has been conducted more frequently with animal subjects, several studies have documented the prevalence and long-term effects of tonic immobility among human trauma survivors. Tonic immobility is a non-learned response that occurs when physical restraint or the perception of inescapability is coupled with extreme fear (Fusé, Forsyth, Marx, Gallup, & Weaver, 2007). Certain characteristics of the individual or the environment affect the response; for example, presence of and proximity of an experimenter, and particularly eye contact, makes tonic immobility in animals last longer (Gallup & Rager, 1996). Some researchers suggest that it is the perception of entrapment, rather than physical restraint, that evokes tonic immobility. Advanced linguistic and cognitive capacities in humans broaden the range of stimuli that can influence the perception of inescapability and transcend the actual stimulus properties of the events (Marx et al., 2008). Factor analyses support the notion of the independent factors of fear and physical immobility inherent in the tonic immobility experience (Fusé et al., 2007).

Individuals who report tonic immobility continue to process environmental stimuli (Gallup, Boren, Suarez, Wallnau, & Gagliardi, 1980; Marx et al., 2008), as tonic immobility can be terminated in response to salient visual or auditory cues (Heidt et al., 2005). Animals exhibiting tonic immobility are responsive to many modes of environmental stimuli, including visual, auditory, tactile, and nociceptive (Gallup & Rager, 1996). Animals exhibit motor suppression with intact sensory capacities; they can sense the stimuli but do not observably react.

For example, the heart rates of birds increase in response to sudden noises (Ratner, 1967).

Individuals experiencing tonic immobility are also generally able to recall vividly details of the event (Abrams, Hons, Carleton, Taylor, & Asmundon, 2009; Gallup & Rager, 1996) but it has not been specified whether recollections are cognitive, sensory, or physiological.

Clinical dissociation. Both empirical research and clinical data inform our understanding of the experience of peritraumatic clinical dissociation. Kluft (1992, as cited in Allen & Coyne, 1995) writes that dissociation is activated when sympathetic defensive responses fail or are anticipated to be unsuccessful, which evokes the experience of an “inward flight” in order to escape feeling overwhelmed or threatened. Similarly, Hilgard (1974, as cited in Rhue, Lynn, Henry, Buhk, & Boyd, 1990–1) wrote that children exposed to aversive developmental circumstances often cultivated extensive fantasy involvement as a coping strategy. This absorption in fantasy would serve as a mental escape from harsh or abusive environments. This kind of dissociation allows someone to escape by shifting their internal environment, causing them to describe the experience as “tuning out,” “spacing out,” “zoning out,” experience becoming foggy, hazy, fuzzy, and dreamlike, and sometimes, feeling as if they have entered “a void” or “the blackness” (Allen, in press, as cited in Allen & Coyne, 1995). Patients also describe a feeling of floating, watching themselves from afar, being unaware of time passage, or being in a bubble or behind glass (Allen et al., 1997).

Hypnotic phenomenology bears certain similarities to the kind of peritraumatic detachment seen in clinical dissociation. Hypnosis is a state of highly focused attention while simultaneously suspending peripheral awareness (Spiegel, 2012). The dissociation of some specific perceptual content during a traumatic experience, such as nociception, physical sensation, or visual perception, can be understood as a hypnotic process (Butler et al., 1996). For

example, hypnotic techniques can be used to adjust perception of painful stimuli (Butler et al., 1996), essentially the process entailed in clinical dissociation. Classic hypnotic responses such as time distortion, analgesia and derealization can occur bimodally; someone can experience either enhanced attention or lowering of attention, or depersonalization from the body or enhanced focus on sensory details (Vermetten & Bremner, 2004). The profound absorption in imaginal activity described in clinical observations of peritraumatic dissociation is the defining feature of hypnotizability (Nash & Lynn, 1985–86), and people with high hypnotic susceptibility tend to use it spontaneously during everyday life to alter perception and imagination (Spiegel, 2012). Patients describe intense absorption in fantasy material during traumatic experiences; for example, one patient imagined that she escaped to a field of wild flowers during episodes of physical and sexual abuse from her father (Spiegel, 1986). Gelinas (1983) describes similar defensive peritraumatic experiences of incest survivors, including patients “becom[ing] part of the wall,” “float[ing] near the ceiling and look[ing] at what was happening,” going for imaginal walks or “[becoming] a small mouse seeing what was in the walls of the house” (p. 316).

Perry and colleagues observe this phenomenon in children who exhibit a dissociative response pattern to complex developmental trauma. He writes that traumatized children use dissociative “techniques” that allow them to “go to a different place,” assume different personas, or watch themselves as in a movie. External observers note that these children seem numb, robotic, as if they are “not there” or “staring into space” (Perry, Pollard, Blakley, & Vigilante, 1995). These responses become more prominent if pain is inescapable, uncontrollable, or if the child feels immobilized. He writes that dissociative children alter their neurobiological pattern of response to threat (turning “states” into “traits”) as they increasingly attend to internal or imaginal landscapes to the neglect of external threatening cues (Perry et al., 1995). However, it is

not clear from Perry's conceptualization whether this response can occur peritraumatically (a habitual response with repeated traumatization), or primarily as a pattern of persisting dissociation.

Allen conceptualizes dissociation in response to trauma as a kind of pathological absorption, or dissociative detachment. To be absorbed in one aspect of the internal or external landscape is to be detached from others; it is this detachment that impairs functioning (Allen et al., 1997). This detachment is motivated by fear, and is often experienced as automatic and reflexive. Allen contrasts this experience with the hypervigilance associated with sympathetic arousal, where attention to environmental stimuli is both narrowed and intensified. Instead, pathological absorption involves narrowing of attentional focus and simultaneous disengagement of attention from both external and internal environment (Allen et al., 1997). Consistent with Dell's characterization of clinical dissociation as an alteration of consciousness that *reduces* clarity of perceptual focus on the environment, Allen's pathological absorption is experienced as more diffuse, pervasive, and foggy than the intense focus of normal absorption.

Dell characterizes Allen's conceptualization of severe detachment as "dissociative-like" symptoms of intense absorption, rather than classic dissociative symptoms (which derive from different mechanisms). Dell (2009b) summarizes the differences between normal absorption and the pathological absorption implicated in clinical peritraumatic dissociation:

1. The absorption in the latter is content-less, as if someone is absorbed in a void (feeling "gone" or "blank").
2. It can feel automatic and without a sense of control.
3. It is associated with the kind of memory gaps resulting from impairment of the elaborative encoding that is required for coherent autobiographical memory.

This is the kind of peritraumatic detachment that may have been experienced by survivors of sexual assault, whose memories of rape are less clear and vivid, contain a less meaningful order, and are less clearly remembered than memories of other unpleasant experience (Tromp, Koss, Figueredo, & Tharan, 1995).

Figure 1 illustrates the phenomenological differences between the proposed types of peritraumatic dissociation.

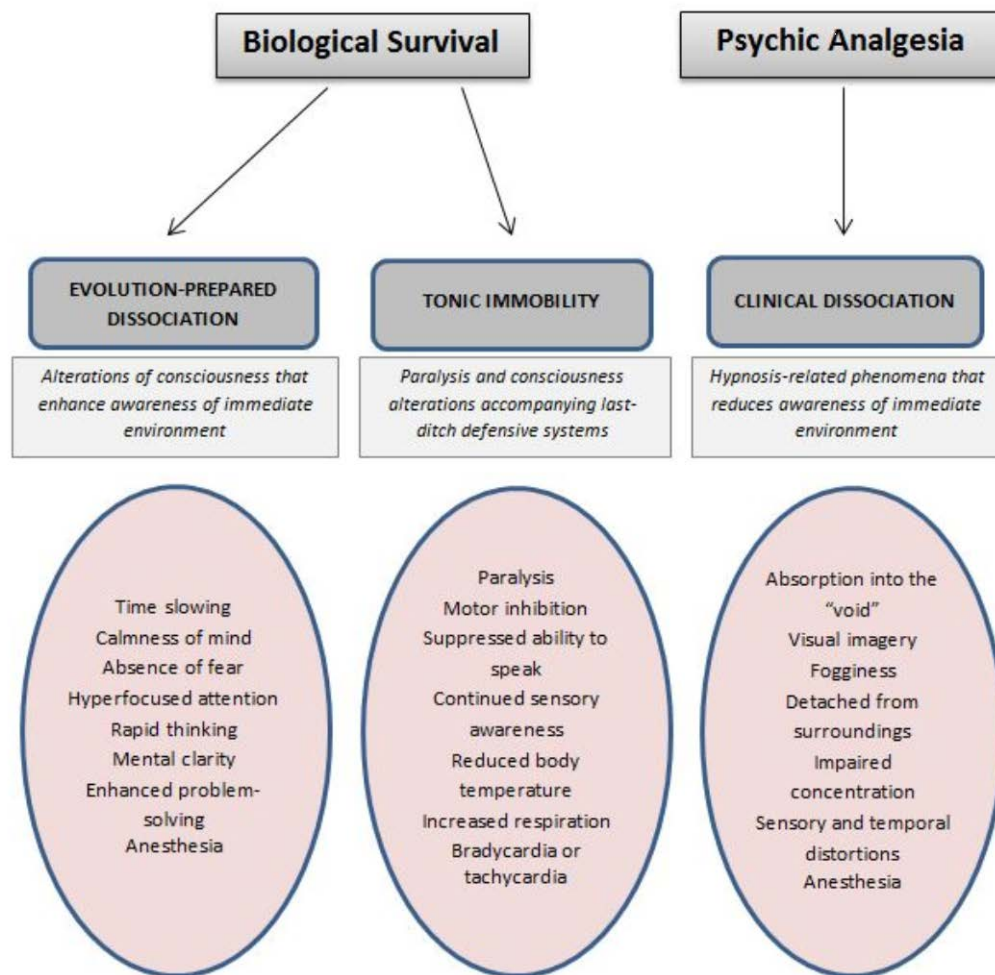


Figure 1. Conceptual model of phenomenological characteristics of each proposed cluster of peritraumatic dissociation.

Neurobiological Differences

Evolution-prepared dissociation. Biological threat processing is generally mobilized in a specific order, depending on the proximity of the predator. This processing occurs in a set of prepackaged behaviors that offers the highest likelihood of survival and is unique to a particular species (species-specific defense reactions; Bolles, 1970, as cited in Fanselow, 1994).

Environmental conditions will determine which restricted sets of defensive responses maximize the chance of survival, and this is primarily determined by level of fear and predatory imminence (Fanselow, 1994).

The initial response to an unexpected or novel event is characterized by the orienting reflex, in which the organism focuses intently on the event. Orienting is accompanied by rapid deceleration of the heart (bradycardia) and temporary immobility as a result of both increased activation of the sympathetic nervous system and even greater activation of the parasympathetic nervous system (Sokolov & Cacioppo, 1997, as cited in Dell, 2010c). The purpose of the orienting reflex is not defensive, despite similar arousal of somatic and autonomic activity recruited in defensive reflexes, but merely designed to orient the organism to the environment (Öhman et al., 2000). The orienting reflex may be homologous to the trauma-evoked dissociative responses that are not defense in nature, described by Beere (2009). These reactions appear dissociative because they are associated with perceptual hyperfocus on environmental stimuli.

Threat detection or moderate levels of fear activate post-encounter defenses (Fanselow, 1994). Once a threat has been detected, the immediate response is for the prey animal to reactively freeze. This stage is accompanied by focused attention, sustained bradycardia, defensive analgesia, and potentiated startle response in order to prepare the animal for action (Marx, Forsyth, Gallup, Fusé, & Lexington, 2008). Research suggests that this “reactive

immobility” is organized by the dorsolateral PAG area of the mammalian brain (Vianna & Brandão, 2003). The defensive behavior generated by the dorsolateral PAG seems to represent an unconditioned fear response. However, the PAG is likely not the final common path for defense reactions; ascending connections to the cingulate cortex shape the expression of freezing (Vianna & Brandão, 2003). Although difficult to study in animals, time perception and spatial memory changes are common evolutionarily-prepared dissociative responses that accompany reactive freezing and possibly other defensive subsystems. Evidence suggests that these alterations in automatic processes represent altered modulator and regulator functions mediated by the cerebellum (Ursano, Fullerton, & Benedek, 2007).

As the threat moves closer, the animal is in a state of growing tension and becomes increasingly prepared to explode into flight at the last moment, as long as escape seems possible. When escape no longer is realistic, the animal mobilizes an aggressive response. The mode changes with even a single contact with a threat, causing an activity burst and circa-strike defensive mode (Fanselow, 1994). Both flight and fight are associated with inactivation of the parasympathetic nervous system and activation of the sympathetic nervous system, and are mediated by the dorsolateral PAG (Vianna & Brandão, 2003). Nociceptive stimuli appear to activate the dorsolateral PAG through direct connections from the spinal cord and trigeminal nucleus, as well as sensory projections from the superior colliculus (Fanselow, 1994). The locus coeruleus is another critical structure mediating this classic “fight or flight” defensive system, and maintains projections to major brain regions as a regulator of noradrenergic tone and activity (Perry et al., 1995). The structures mediating circa-strike (escape or attack) and post-encounter (freezing) defense modes have an inhibitory interactive relationship, which enables rapid switching between defensive modes according to the degree of threat and fear (Fanselow, 1994).

Sierra and Berrios (1998) summarize dual mechanisms that characterize the state of depersonalization, which parallels evolution-prepared dissociative experiences. One pattern of response is a state of increased alertness that triggers arousal systems and prefrontal attentional systems (particularly the right dorsolateral prefrontal cortex), which reciprocally inhibits the anterior cingulate and results in “mind emptiness” and analgesia. The other pattern of response involves the left prefrontal cortex, which inhibits amygdalar activity and the anterior cingulate, leading to decreased autonomic activity, dampened emotionality, and feelings of unreality and detachment (emotional and somatic). Thus, depersonalization is an adaptive response that consists of dual response tendencies—one intensifying alertness and the other inhibiting potentially interfering emotion (Noyes & Kletti, 1977). These reciprocal physiological cascades have evolved to maximize survival in aversive situations in which the individual has no control over the environment and the source of danger cannot be localized. In these circumstances, the adaptive response of vigilant attention or reactive immobility is enhanced by the ability to sustain multisensory scanning of pertinent information in the environment (Sierra & Berrios, 1998).

Tonic immobility. Tonic immobility is the species-specific defense reaction that becomes activated when circa-strike defenses prove ineffective in the face of continued threat. In this phase, the amygdala (communicating information about the level of threat) projects to caudal portions of the ventral PAG, activating immobilized freezing and associated opioid analgesia, and to the hypothalamus, mediating autonomic and endocrinological responses (Fanselow, 1994; Schmahl & Bohus, 2007). Studies support the recruitment of the ventrolateral PAG in immobility, hyporeactivity and quiescence, in contrast to the defensive alerting and reactive freezing responses mediated by the lateral PAG (Depaulis, Keay, & Bandler, 1994). The sympathetic nervous system is active but suppressed by a massive activation of the

parasympathetic nervous system (Engel, 1978). Physiological measurements from studies on immobile vertebrates show a “flattened” EEG and increased autonomic activity (Ratner, 1967).

Porges’ (2004) polyvagal theory suggests that there are two vagal motor systems that serve different survival purposes and have distinct evolutionary origins (Öhman et al., 2000). The vagal projections have different locations in the brain stem: the “smart” myelinated branch originating in the nucleus ambiguus and an unmyelinated vegetative branch originating in the dorsal motor nucleus. According to this theory, these vagal branches, which evolutionarily predate the sympathetic system (Öhman et al., 2000) evolved as a function of three stages of development in the mammalian autonomic nervous system. Immobilization originates from the dorsal motor vagal projection, mobilization is enabled by the sympathetic nervous system, and social communication and engagement is mediated by the myelinated “smart” vagus (Porges, 2004). Tonic immobility and all its accompanying physiology would thus be a function of the unmyelinated dorsal vagal fibers. This theory underscores the difference between freezing and paralysis; freezing involves sympathetic arousal and paralysis is mediated by dorsal vagal tone (Nijenhuis & dan Boer, 2007).

Clinical dissociation. Dell (2009b) argues that clinical dissociation is a “phylogenetically-recent manifestation of dissociation” (p. 802). Dell proposes that phylogenetically-recent manifestations of dissociation, such as dissociative intrusions and structures, arise from more recently-developed neural structures, such as the neocortex.

There is evidence to suggest that the parietal cortex may be part of the neural circuitry involved in involuntariness and related phenomena that one might observe in clinical dissociation (Dell, 2010). The parietal cortex plays a critical role in the awareness of action and sense of agency by generating motor images and storing motor representations that are required

for these images (Blakemore & Frith, 2003). This function of the parietal lobe is critical in distinguishing between self-produced actions and other-generated actions, and classifies movements as “external” (someone outside the self performing the action). It is thought that in patients with hallucinations or passivity experiences (feeling as if an external force is controlling the person), the predictive mechanisms mediated by the right parietal cortex may not be functioning as they should (Blakemore, Wolpert, & Frith, 2000; Ganesan, Hunter, & Spence, 2005). In contrast, awareness of causing an action and experiences of agency and body ownership are associated with activation in the anterior insula (Farrer & Frith, 2002). Body ownership refers to the unique perceptual experience of one’s own body, so that body sensations are specific to oneself (Gallagher, 2000). Body ownership can be disrupted in dissociated experience involving automaticity. Thus, the inferior parietal lobe is particularly relevant for experiences that feel non-agentic and external to the self, such as dissociated structures, hallucinations, and the involuntariness and automaticity central to hypnotic phenomena (Dell, 2010).

Other neurological areas that are potentially implicated in clinical dissociation include the ventral premotor area (Daprati et al., 1997) and right angular gyrus (Farrer et al., 2008; both areas contributing to sensing aspects of one’s own actions and the feedback loop involving intention and consequences of a movement), the right posterior insula and right frontal operculum (Tsakiris, Hesse, Boy, Haggard, & Fink, 2007) and the right temporo-parietal junction (Tsakiris, Constantini, & Haggard, 2008; all involved in coherent body ownership and consciousness of self as distinct from external objects). The right temporo-parietal junction is particularly implicated in the multisensory integration and the maintenance of a stored model of one’s own body that is required to demarcate one’s body as a physical object distinct from

external objects (Tsakiris et al., 2008). Attribution of body ownership is distinct from action attribution, as the latter involves an additional efferent component that goes beyond agency or body sense (Tsakiris et al., 2007).

Neurobiological basis of hypnotic phenomena. Given that hypnotic susceptibility and associated absorption and detachment appear comparable with the phenomenological experience described in clinical peritraumatic dissociation, it is relevant to summarize existing research on the neural correlates of these experiences. Studies on hypnosis reveal similar neural patterns that have been found to be associated with the experience of one's body and actions being directed by external forces (Dell, 2009b).

Analogously to clinical peritraumatic dissociation, hypnotic phenomena also seem to be based in the neocortex and more evolutionarily recent areas of the brain. Hypnotic states are associated with an activation of a broad range of cortical and subcortical areas, including the occipital, parietal, precentral, premotor, ventrolateral prefrontal and anterior cingulate (Faymonville et al., 2006; Oakley, 2012), and the sensory cortices affected by hypnotic perceptual alteration, such as visual, somatosensory, auditory, and olfactory (Spiegel, 2012). In a study using PET imaging, Rainville and colleagues found that hypnotic relaxation caused a decrease in cortical arousal (not peripheral arousal) involving reduced activity in the somatosensory cortices, whereas the unique effects of hypnotic absorption (independent of relaxation) affected the bilateral middle and inferior temporal gyri, right somatosensory cortex, right inferior parietal lobule, anterior cingulate cortex, and bilateral prefrontal lobules (Rainville, Hofbauer, Bushnell, Duncan, & Price, 2002). The pathways involved in the absorption effect overlap significantly with the neurobiology of the executive attentional network (Rainville et al., 2002). In particular, the reduction of activity in the posterior parietal cortex may be a neural

correlate of disengagement with external stimuli. The posterior parietal cortex is also involved in the sense of agency, automaticity, and the “externality” detector hypothesized to be at the basis of clinical dissociation.

Neurological differences may underpin individual differences in hypnotic susceptibility. In comparison to individuals with lower hypnotic susceptibility, people with high hypnotic susceptibility have a larger rostrum (an area of the corpus callosum involved in communication between prefrontal cortices and allocation of attention) and more effective frontal attentional systems that prevent extraneous stimuli from entering conscious awareness (Horton, Crawford, Harrington, & Downs, 2004). The degree to which hypnosis reduces pain perception is modulated by activation of the midcingulate cortex, which is essential for hypnosis-related alterations of perception (Faymonville et al., 2006). Interestingly, hypnosis-related reduction of nociception is independent from opioid mechanisms, as blockage of opioid receptors does not interfere with hypnotic analgesia (Spiegel, 1991). The neural pathway associated with hypnotic analgesia depends on the nature of the perceptual change; reduced perception of pain decreased activity in the somatosensory cortex (Spiegel, 2012), while reduced concern about pain lessened activation in the anterior cingulate gyrus (Rainville, Duncan, Price, Carrier, & Bushnell, 1997). This finding highlights the more phylogenetically-recent origins of hypnotic phenomena, which appears to involve higher cortical attentional gating than the analgesia related to animal defenses such as tonic immobility.

Evolutionary or Adaptive Differences

General principles of evolution. Prior to describing the evolutionary underpinnings of the theorized peritraumatic dissociation clusters, it is necessary to elucidate some foundational principles of evolution and natural selection.

Evolution is a core feature of biology, heavily drawn from upon an explanatory framework in the scientific field (Bozorgmehr, 2012). Evolvability is defined as the capacity to generate heritable, selectable phenotypic variation (Barton & Partridge, 2000). Natural selection is assumed to be the primary mechanism for evolutionary change, and was originally explicated by Charles Darwin in the 1850s. Darwin believed that mutations conferring greater reproductive success to an organism would be more prevalent in a species and more likely to be perpetuated in subsequent generations (Bozorgmehr, 2012). Natural selection is a process that enables the accumulation of heritable differences between organisms, and the accumulation of these differences results in disproportionate representation in subsequent generations of a collection of organisms that reproduce with each other (Donahoe, 2012). The only criterion for evolutionary change is the effect that a trait has on reproductive fitness. The effect on fitness underlies the difference between structural functionality (what is functional or not to the organism) and biological utility (reproductive fitness; Bozorgmehr, 2012). Natural selection is not a paradigm for the long-term functional benefit of a species, but only the immediate survivability of traits across generations. Further, natural selection cannot be the mechanism for the diversity of life, but only for the survival and continuing reproductive probability of life (Bozorgmehr, 2012).

The selection process in natural selection is comprised of three interdependent phases: variation, selection, and retention (Donahoe, 2012). In the variation phase, natural selection acts on an existing variation of phenotypic traits in a population. It is the “source of whatever novelty arises from repeated cycles of the selection process” (Donahoe, 2012, p. 250), and is required for selection to operate upon. The selection of traits is dependent on the effect the trait confers on the organism’s reproductive fitness, and leads to complexity when the environmental factors acting on the population of variants favors one variant over another. Retention allows selected variants

to exist for the time required for future rounds of selection to occur, causing the selection of variants to accumulate (Donahoe, 2012). Selectionism enables the development of complex phenomena in a population by permitting the accumulation over time of products of small, simple processes. For example, selectionism shaped the complexity of the vertebrate nervous system through cumulative simple changes, and thus patterned human physiology and the behavior dictated by the structure and function of the nervous system (Porges, 2004). This is the mechanism by which evolutionary forces have expanded the range of human affective and behavioral repertoire.

Evolution-prepared dissociation. Evolution-prepared dissociation and tonic immobility are both arguably the only types of dissociation on which natural selection has directly acted (Dell, 2009b), being the only types of dissociation that confer reproductive fitness by increasing the likelihood of an organism's survival. Any stimulus of functional significance to the survival of an organism elicits autonomic nervous system behavioral sets, allowing the organism to find water, food, and shelter; reproduce; and avoid threat (Öhman et al., 2000). This includes the deeply ingrained autonomic origins of the physiology and behavior that lead to the experience of evolution-prepared dissociation. These responses have been observed uniquely in life-threatening circumstances (being the only situations in which these phenomena carry evolutionary advantages). Someone who is paralyzed by dread in terrible but less dangerous circumstances can achieve remarkable problem-solving, vitality, and depersonalization in circumstances that carry a threat of death (Noyes & Kletti, 1980). When there is even a slight possibility of surviving a threat, the individual mobilizes biological systems crafted by evolution to enhance physical and mental alertness for the purpose of surviving (Roberts & Owen, 1988).

The defensive systems mobilized in response to threat were shaped by selection processes

over time, as variants in a population were selected only in animals that survived predators and threats long enough to reproductive age. These complex sequences of responses are activated as a function of the defensive distance of the threat. The sequence (orienting, alert/freezing, flight and moving away, fight, and immobility) is influenced by the dynamic ecological context conveyed by the predatory imminence continuum described by Fanselow (1994). This is the kind of complex phenomenon involving motor, sensory, autonomic, endocrinological, and emotional components that results from the selection and accumulation of simple processes over time.

Tonic immobility. Tonic immobility is the only other type of dissociative experience that has been directly cultivated by natural selection. Tonic immobility is a type of innate behavior, described by Ratner (1967) as complex behavior that is observed among a wide range of species, is relevant to species' survival, occurs in the natural life of an animal, involves specific stimulus and fixed response patterns, includes adaptation of the response, involves physiological factors, and does not require learning for initial occurrences of the behavior. Tonic immobility is part of the sequence of predatory imminence, and is a response to attack and contact by a predator as a means of enhancing survival (Ratner, 1977). This response has phylogenetically-ancient origins and was very early on selected and retained in a variety of populations, as it has been observed in many types of invertebrates, including water bugs, sand fleas, spiders, octopuses, mantids, shrimp, and wood lice (Ratner, 1977). It is generally agreed in scientific literature that the dorsal vagal tone at the biological basis of tonic immobility emerged very early in vertebrate and invertebrate evolution (Öhman et al., 2000), as it clearly confers evolutionary and reproductive fitness.

Clinical dissociation. In contrast to peritraumatic dissociation that occurs as an element of animal defenses, clinical peritraumatic dissociation would not directly emerge from

evolutionary pressures because the particular dissociative abilities associated with this cluster would not be critical to human survival. There is no evidence that the capacity for hypnotic susceptibility, absorption, or dissociation has been directly subjected to selective processes, and instead seems to be a normal variant of the nervous system (Dell, 2009b). Natural selection has not cultivated the ability for clinical dissociation because it does not increase or decrease reproductive fitness. Rather than conferring fitness, Dell proposes that varying individual propensities for dissociation are manifestations of normal variation upon which natural selection can act. The argument that clinical dissociation is phylogenetically-recent and occurs in the population with a wide span of individual variation underscores the idea that it likely did not play a significant role in enhancing human survival. For example, hypnotic susceptibility, which is associated with this kind of dissociative symptomatology, is normally distributed in clinical and nonclinical populations (Butler et al., 1996). Researchers argue that given the massive degree of variation in genetic sequences, most of this variation has no effect on reproductive fitness, because it would be impossible to be all maintained by selection (Kimura 1961, as cited by Barton & Partridge, 2000). Instead, variation provides the raw material upon which selection acts and is the source of novelty from repeated cycles of the selection process (Donahoe, 2012).

Evolutionary-prepared dissociation was naturally selected because of its contribution to survival enhancement. However, evolution likely did contribute to the selection and maintenance of mental and neural capacities that allow for highly focused attention and an ability to modulate sensory input, which are the capabilities that support hypnotic phenomena. These capacities may have been selected for their ability to foster social learning and interaction, avoidance of predators, and detachment from peripheral stimuli to engage in survival-related tasks (Spiegel, 2012). Spiegel (2012) argues that hypnotizability is an adaptive method of learning and relating

to others during childhood. Once evolution produced this means to maximize the chances of survival, the mechanisms of attentional and perceptual manipulation may be used for purposes other than purely survival, such as a means to reduce or block physic pain (Dell, 2009b). This trait would be characterized by the variability in the attentional capacity for manipulating information that underpins clinical dissociation.

Researchers have argued that dissociative responses are protective in that they prevent someone from encoding a threatening experience (Horowitz, 1986, as cited in Bryant, 2009). This deficit in elaborative encoding is consistent with phenomenology of clinical dissociation, but would certainly not be adaptive in life-threatening situations that would be more likely to evoke evolutionary-prepared dissociation as a means to enhance likelihood of survival. Organisms that do not encode details of threatening situations or predators would not learn to avoid these threats or mobilize defenses quickly in response to these situations in the future. Alleviating psychic pain would be the kind of motivation that results in the subjective experience involved in clinical dissociation, but it is not a capacity that was directly cultivated by natural selection.

Given these differences in evolutionary and neurological basis, these proposed natural groupings of peritraumatic dissociation clearly derive from divergent functions and mechanisms. As such, they occur in the context of contrasting types of experiences and specific characteristics of individuals. The theory of discrete types of peritraumatic dissociation will now be integrated with existing literature to suggest factors that influence the primary experience of peritraumatic dissociation, including type of traumatic event, age at which trauma is experienced, and frequency or repetition of trauma.

Factors that Influence the Experience and Type of Peritraumatic Dissociation

There are several factors that influence which particular cluster of peritraumatic dissociation will be most likely to occur in a specific individual in response to a specific kind of traumatic event. Individualized responses to trauma have been well-documented; Perry et al. (1995) list relevant factors that shape a specific response to trauma: (a) premorbid functioning and history of previous stressors; (b) age; (c) the specific cognitive meaning of an event assigned by an individual; (d) the nature of the trauma; and (e) the presence of other factors that exacerbate or attenuate the effect (such as disrupted attachment with caregivers or early intervention). Underscoring the variety of response, dissociative reactions to perceived threat can differ in one person, depending on autonomic nervous system response (Nijenhuis & den Boer, 2007) or cortical gating.

The nature of the traumatic event. There has been insufficient research delineating the impact of the specific nature of the traumatic event on the experienced cluster of peritraumatic dissociation. Although there is limited empirical investigation of this relationship, it appears that most anecdotal description of clinical peritraumatic dissociation in practice seems to be related to interpersonal trauma, particularly trauma perpetuated by a caregiver or significant attachment figure. Spiegel (1986, as cited in Cole, Alexander, & Anderson, 1996) writes that abusive family relationships, particularly ongoing, engender a dissociative response as a primary means of tolerating this ongoing trauma, which interferes with the development of the self. It remains unclear in this formulation whether this dissociative response is peritraumatic, persisting or both.

Documentation of subjective experiences during interpersonal traumatic events, particularly those occurring in an attachment or family context, have the pattern of appearing to result in the pathological absorption and hypnotic phenomena that underlie clinical peritraumatic

dissociation. For example, one study found that in comparison to memories of more ordinary distressing experiences, memories of sexual assault were less clear and vivid, ordered in a less meaningful way, were less well-remembered, and were less thought about (Tromp et al., 1995). These memories are consistent with the disruption of encoding that might be predicted in clinical dissociation, as clinical dissociation would cause a person to have limited attentional and perceptual focus on the actual event or the environment. In a retrospective study of women who survived childhood abuse, women who experienced penile penetration, believed someone/thing else would be killed, and/or were injured during the course of the abuse evidenced more severe peritraumatic dissociation (Johnson, Pike, & Chard, 2001). However, it is not yet clear whether the nature of the peritraumatic dissociation was biologically defensive in origin, or more related to neocortex-based clinical dissociation.

Tonic immobility is the one type of peritraumatic dissociation that has been studied empirically in the context of the specific nature of an accompanying traumatic event. Tonic immobility appears to be a common experience in many different types of trauma. The prevalence of tonic immobility during sexual assault of females ranged in one study from 41.5% reporting significant immobility and 12.5% reporting extreme immobility (Fusé et al., 2007). Another study found that 52% of participants reported tonic immobility experiences in response to childhood sexual abuse (Heidt et al., 2005). There is evidence for non-significant relationships between tonic immobility experienced during sexual assault and exposure to violence in childhood and characteristics of the assault, including injuries suffered, presence of weapons, and relationship between the victim and the assailant (Galliano, Noble, Travis, & Puechl, 1993). There appear to be no differences in frequency or severity of tonic immobility reported across differing types of trauma, including witnessing violence, experiencing an accident, or

interpersonal trauma (Abrams et al., 2009). However, tonic immobility is reportedly higher in groups experiencing physical, psychological, or sexual abuse than those receiving news of mutilation, serious injury, or violent/sudden death of a loved one (Bados, Toribo, & Garcia-Grau, 2008). It is likely that tonic immobility is experienced with comparable frequency across various types of trauma, but that the trauma has to be experienced as direct threat.

The proposed research study component of this dissertation seeks to clarify whether specific kinds of traumatic events cluster with groupings of peritraumatic experience. It is predicted that life-threatening, single event, and/or non-interpersonal traumatic events would be more likely to elicit evolutionary-based dissociation rather than clinical dissociation, as this defensive system evolved for the purpose of surviving life-threatening events (falls, animal attacks, motor vehicle accidents, natural disasters, certain kinds of combat trauma, etc.). Trauma that is accompanied by extreme fear and entrapment and experienced as a direct threat to life would be predicted to result most often in tonic immobility. In contrast, interpersonal trauma, particularly incest or repeated trauma perpetuated by caregivers (trauma that bears no direct threat to biological survival), is predicted to be associated more often with clinical peritraumatic dissociation.

Age. There is evidence that the age at which a trauma occurs has a significant bearing on the type of dissociative experience associated with the event. Generally, the younger the individual, the more likely he or she will use dissociative adaptations over hyperarousal or sympathetic nervous system-based reactions (Perry et al., 1995). Perry's description of dissociative adaptation most clearly maps onto clinical peritraumatic dissociation. In Perry's experience, other factors that influence this dissociative response includes the degree of immobilization, helplessness, and powerlessness of the individual. In the developing brain,

repeated responses to trauma organize neural and biological systems, resulting in traits (Perry et al., 1995). This is the mechanism by which persisting clinical dissociation becomes a habitual response to threat. In support of the idea of use-dependent internalization of threat response, one study revealed that the propensity for absorption in adulthood was highest in those abused before seven years of age (Hesse & Van Ijzendoorn, 1999).

Children generally have a higher capacity for dissociation than adults, specifically the type of dissociation that involves absorption or distancing from the environment (state switching, imaginary friends and internal voices, distancing from distress, suggestibility; Cole, Alexander, & Anderson, 1996). This finding makes sense in light of an abundance of research supporting higher levels of hypnotizability in childhood, particularly from age 5 until about 10-14 years of age (Frankel, 1990; Morgan & Hilgard, 1973), with a gradual decline during adolescence and stabilization in adulthood (Classen & Koopman, 1993). Children have different cognitive abilities for encoding, understanding, and processing traumatic events than adults, being in a less mature developmental stage (Salmon & Bryant, 2002). The younger the individual, the lower the capacity for integration of the trauma into conscious self-experience due to immaturity of the nervous system (Steele et al., 2009), and the more long-term damage the event causes (Classen & Koopman, 1993).

Frequency and repetition. Repetition of trauma and individual response to trauma, particularly when experienced at a young age, causes progressively automatic and involuntary means of responding (Dorahy & van der Hart, 2007). Although there is a dearth of literature on whether this is the case for evolution-prepared defenses, this seems to hold true when clinicians and researchers describe clinical dissociation. There is evidence from the literature on survivors of sexual abuse in which initially involuntary, physical experiences of peritraumatic dissociation

subsequently lead to voluntary inducement of dissociative states with repetition of trauma. This mechanism for this increasingly controlled and voluntary process is assumed to be self-hypnosis (van der Kolk 1987, as cited in Young, 1992), which is potentially associated with clinical peritraumatic dissociation. In this way, repeated experience creates a template through which ongoing and future experience is processed and filtered, and thus increasingly minor stressors will then be more likely to evoke the full dissociative response (Perry et al., 1995).

Differential Risk for Posttraumatic Symptomatology and Sequelae

Given the distinct phenomenological, neurological, and evolutionary underpinnings of these dissociative clusters, they are predicted to carry different degrees of risk to trauma sequelae, such as persisting dissociation, PTSD, and the dissociative subtype of PTSD. The rationale and basis for differential risk for posttraumatic sequelae carried by these groups of peritraumatic dissociation will be discussed.

Persisting dissociation. Clinical dissociation occurring repeatedly in response to trauma, particularly as a habitual response in childhood, has implications for establishing a long-term and persistent dissociative response to ongoing life stressors (Allen & Coyne, 1995; Gelinas, 1983; Spiegel, 1986). Perry et al. (1995) writes that mental and physical adaptations to trauma such as dissociation, particularly those that occur at a young age, sets up the nervous system for the establishment of a “trait” response to subsequent threats. This use-dependent organization of the nervous system is the mechanism by which persisting acute adaptive states become maladaptive traits. The dissociation of neural pathways that associate self-awareness with perception of emotional body-state may lead to the development of dissociated self-states in traumatized children (Frewen & Lanius, 2006). Attachment studies may lend credence to this concept; children of unresolved caregivers that exhibit frightened or frightening behavior may cope with

overwhelming contradictory affects by entering dissociative states (appearing dazed or in a “trance” to observers) and experience rapid shifts in appraisal of self or other (victim, perpetrator, rescuer, etc.; Hariri, Bakermans-Kranenburg, & van Ijzendoorn, 2007). These children will be more vulnerable to dissociative reactions in response to ongoing threat or stress. Further, there is evidence that traumatic experiences that would be predictably associated with peritraumatic clinical dissociation, such as severe childhood abuse (particularly abuse perpetrated by caregivers), may contribute to the development of hypnotizability in normal populations (Nash & Lynn, 1985–86) and dissociation in clinical populations (Chu & Dill, 1990).

Trait hypnotizability and the auto-hypnotic phenomena it engenders (such as that observed in clinical dissociation) may be overused as a coping response and become a fixed style of defense marked by ongoing dissociative symptoms (Butler et al., 1996; Frankel, 1990), eventually forming individuals’ relationships with themselves and the world (Classen & Koopman, 1993). Bliss (1984) argues that this “abuse” of self-hypnosis and automatic induction of trance state in response to threat is the mechanism of development of Dissociative Identity Disorder. A dissociative style of self-regulation becomes an entrenched and unending cycle when persisting dissociation occurs in response to the stress of one’s own posttraumatic symptoms (Allen & Coyne, 1995).

Post-Traumatic Stress Disorder. As described in the literature review, existing research has not sufficiently delineated clinical peritraumatic dissociation from tonic immobility from evolution-prepared dissociation in establishing relationships with PTSD symptomatology. Tonic immobility appears to be associated with PTSD, and clinicians argue a link between clinical peritraumatic dissociation and persisting post-trauma symptoms. However, there is little to no evidence that evolution-prepared dissociation alone is related to posttraumatic stress symptoms

(McNally, 2003). In one study, symptoms of dissociation were observed in all healthy subjects exposed to high-intensity stress, indicating that the presence of some kinds of dissociation or stress-induced dissociation alone is not necessarily a significant predictor of PTSD (Morgan III, Southwick,, Hazlett, & Steffian, 2007). It is possible that this finding is related to the evolution-prepared dissociation that is predicted to result from high-intensity (and non-interpersonal) stress.

Research supports a relationship between tonic immobility and increased reports of PTSD symptoms (Heidt et al., 2005), particularly in the re-experiencing and hyperarousal domains of PTSD (Abrams et al., 2009). Scores for the factors of physical immobility and fear both positively correlated with increased reports of depression, anxiety, and peritraumatic dissociation (Heidt et al., 2005). Tonic immobility, but not traditional peritraumatic dissociation, maintained its status as a predictor of PTSD symptoms after controlling for potential confounders (negative affect, sex, and time elapsed since trauma; Rocha-Rego et al., 2009). Further, tonic immobility was associated with a poorer response to a standard pharmacotherapy for PTSD after controlling for other variables when compared to traditional peritraumatic dissociation and physical panic symptoms (Lima et al., 2010).

It is possible that tonic immobility is associated with increased shame for the inability to mobilize more active defense responses during a traumatic experience. Shame may also be associated with negative or invalidating reactions from others (Volchan et al., 2011). Survivors of sexual assault who experienced tonic immobility often evidence a belief that greater resistance would have contributed to more people believing that they were raped (Galliano, Noble, Travis, & Puechl, 1993). Possible explanations for the link between tonic immobility and PTSD also include the hypothesis that both are byproducts of the same experience, or that the tonic

immobility phenomenon in itself may be traumatic (Marx et al., 2008).

There is evidence that clinical dissociation during a traumatic event may increase the likelihood of developing PTSD. Allen et al. (1997) argue that severe dissociative detachment may contribute to post-trauma psychotic symptoms by detaching the individual from markers of internal and external reality. Butler et al. (1996) adopts a Janetian argument that dissociation during trauma inhibits trauma processing and grief work, increasing susceptibility to PTSD. The type of traumatic experiences that are predicted to be more likely to evoke clinical peritraumatic dissociation, including interpersonal trauma such as childhood and adult sexual and physical abuse experiences, appear to engender stronger associations between peritraumatic dissociation and PTSD (Hetzel & McCanne, 2005; Johnson, Pike, & Chard, 2001). In a meta-analysis that studied the variability of the correlations between peritraumatic dissociation and posttraumatic symptomatology, it was found that when individuals perceived themselves to be deliberately targeted by the cause of the traumatizing event (as opposed to natural disasters and accidents, which are predicted to be associated with evolution-prepared dissociation), the relationship between peritraumatic dissociation and posttraumatic stress is stronger (Lensvelt-Mulders et al., 2008). Further, only studies on childhood abuse were responsible for a significant difference in effect sizes of the relationship between peritraumatic dissociation and PTSD in these studies.

In one study of PTSD development in physical assault survivors, all dissociative symptom clusters of ASD (detachment, restricted awareness of surroundings, depersonalization, derealization, and dissociative amnesia) were simultaneously entered in a logistic regression (Eklit & Brink, 2004). The only significant predictor of PTSD variance in this simultaneous logistic regression was restricted awareness, which is consistent with the definition of clinical dissociation as a phenomenon that decreases awareness of the environment. If clinical

dissociation can be found to occur peritraumatically (rather than solely in persisting post-trauma dissociation), it is likely that it would increase the risk of PTSD symptomatology.

Dissociative subtype of PTSD. The dissociative subtype of PTSD is used to describe individuals who meet the criteria for PTSD and also have persistent symptoms of depersonalization and derealization (APA, 2013). In a survey distributed to patients from a diverse set of countries, 14.4% of respondents suffering from PTSD experienced dissociative symptoms (Stein et al., 2013). The dissociative subtype is associated with male sex, childhood onset of PTSD, and high exposure to traumatic events and childhood adversity prior to the onset of PTSD (Stein et al., 2013). Typically, these patients present with more severe PTSD symptoms, greater role impairment, and more significant suicidality than non-dissociative PTSD patients (McFarlane, 2013). There are a number of factors associated with a traumatic experience that have implications for the development of the dissociative subtype of PTSD. McFarlane (2013) argues that this subtype is related to repeated traumatization and age of trauma exposure rather than the particular nature of the trauma. However, victims of child abuse are likely to be characterized by this kind of trauma, given early age of exposure and the typically repeated nature of abuse.

Lanius and colleagues argue that this subtype is associated with emotional overmodulation in response to reminders of traumatic events, as opposed to the intrusive/hyperaroused pattern of acute trauma response (Lanius et al., 2010). These patients typically report higher levels of distress, but lower levels of autonomic physiological reactivity (Griffin et al., 1997). This phenomenon of reporting more negative emotion than would be expected given the degree of physiological response is called emotional response discordance and has also been observed in people experiencing peritraumatic dissociation (Pole et al., 2006)

In a series of neuroimaging studies, Lanius and colleagues demonstrated that approximately 30% of patients respond to trauma scripts by dissociating (have feelings of leaving their body or viewing traumatic memory 'at a distance' with no accompanying increase in heart rate and a differential pattern of neural activation; Lanius, Bluhm, & Lanius, 2007). These patients have higher levels of brain activation in the superior and middle temporal gyri, inferior frontal gyrus, occipital lobe, parietal lobe, medial frontal gyrus, medial prefrontal cortex, and anterior cingulate gyrus than healthy controls. There is also a difference between healthy controls and dissociative PTSD patients in functional connectivity between neural circuits responsible for interoception and perception of somatic processes and emotions, such as the right insula and the left ventrolateral thalamus, (Lanius et al., 2007). This pattern of brain activation supports the notion of persisting clinical dissociation in these patients, given that clinical dissociation is theorized to involve frontal, occipital and parietal areas that overlap with the neural underpinnings of hypnotic susceptibility. People who experience these dissociative reactions to traumatic script-driven imagery describe their experience not as a perceptual hyperawareness of environmental stimuli (evolution-based dissociation), but as a detached distancing (clinical dissociation), endorsing "I was looking down at myself from above," "I was detached from my body," "I was completely zoned out and floating," or "I was emotionless" (Lanius et al., 2007). Patients who evidenced this pattern all reported histories of chronic abuse beginning in childhood and, in some cases, continuing to the time of the study. Many people also described dissociation as a defense that they had used over the course of their lives to escape overwhelming stressors. Given the theoretical similarity between the patterns characterizing clinical peritraumatic dissociation (in the domains of neurobiology, phenomenology, and associations with childhood and repeated trauma), it is possible that out of all clusters of peritraumatic

dissociation, manifestations of clinical dissociation will be related to the development of the dissociative subtype of PTSD.

Summary of Theory

In summary, the theory of distinct peritraumatic dissociation clusters delineates groupings of peritraumatic dissociation according to their purpose of biological survival or relief of psychic pain. Both evolution-prepared dissociation and tonic immobility were naturally selected to maximize physical survival. Clinical peritraumatic dissociation occurs as a means to lessen overwhelming psychological pain, is not a product of natural selection, and instead is related to existing trait variability (such as variability in hypnotic susceptibility and absorption). The key differences between these clusters are reviewed in this section, and are also displayed in Table 1.

Table 1

Summary of Core Differences Between Theorized Peritraumatic Dissociation Clusters

	Evolution-Prepared Dissociation	Tonic Immobility	Clinical Dissociation
Function	Responding to threat and enhancing survival	Responding to threat and enhancing survival	Alleviating overwhelming psychological stress or pain
Mechanism	Biological Unlearned	Biological Unlearned	Psychological Involves attentional systems Related to hypnotic phenomena
Phylogenetic Age	Phylogenetically ancient	Phylogenetically ancient	Phylogenetically recent
Evolutionary Basis	Naturally selected Confers reproductive fitness	Naturally selected Confers reproductive fitness	Not naturally selected Function of normal variability in human population
Neurological Correlates	Subcortical Dorsolateral PAG Anterior cingulate cortex Cerebellum Locus coeruleus	Subcortical Ventrolateral PAG Hypothalamus Unmyelinated dorsal vagus	Cortical Parietal cortex Anterior and right posterior insula Ventral premotor area Right angular gyrus Right frontal operculum Right temporo- parietal junction
Characteristics of Associated Traumatic Events	Response to life threatening events	Response to life threatening events associated with extreme fear and sensation of entrapment	Response to trauma that is interpersonally perpetrated (especially by caregivers), begins at a young age, or repetitive/frequent

These clusters differ along the lines of phenomenological experience. Evolution-prepared dissociation elicits the experience of temporal distortion, calmness of mind and mental clarity,

absence of distracting emotions, and hyperfocused thoughts and attention. Tonic immobility is a “last-ditch” defensive attempt to survive imminent threat, and is associated with experiences of being frozen/paralyzed, unable to vocalize, intense fear, feeling cold and numb, and while still maintaining sensory awareness of the environment. Clinical peritraumatic dissociation is more closely related to phenomenology of hypnosis and absorption, and evokes reduced awareness of surroundings, impaired concentration, missing time, sensory changes, and feeling “foggy” or “in a void.”

These groupings all have different neurophysiological correlates roughly corresponding to the phylogenetic age of the defensive subsystem (the more phylogenetically ancient, the more primitive the neurological and biological substrate). Evolution-prepared dissociation seems to be generated by the dorsolateral periaqueductal grey (PAG), anterior cingulate cortex, right dorsolateral prefrontal cortex, and left prefrontal cortex. Tonic immobility is mediated by the ventrolateral PAG, and the unmyelinated branch of the vagus nerve originating in the dorsal motor nucleus. In contrast, clinical peritraumatic dissociation may hijack neural circuitry associated with hypnotic phenomena, such as the inferior parietal lobe, anterior insula, right posterior insula, right frontal operculum, ventral premotor area, right angular gyrus, and right temporo-parietal junction.

These clusters have associations with disparate characteristics of the individual or features of the trauma, and also to carry distinct degrees of risk for persisting dissociation and PTSD. Evolution-prepared dissociation is hypothesized to occur more often in life threatening and/or non-interpersonal-based traumatic events. Tonic immobility likely occurs as a response to all different kinds of trauma, but the trauma has to elicit the experience of entrapment and direct fear for one’s life. Clinical peritraumatic dissociation may be associated with trauma perpetrated

by humans, particularly caregivers, and likely occurs more often when psychological analgesia is a higher priority than direct physical survival. Clinical peritraumatic dissociation may also be more often experienced in individuals who have undergone trauma at a young age, and particularly with frequent or repeated trauma. It is hypothesized that clinical peritraumatic dissociation will be associated most highly with persisting dissociation after the traumatic event, PTSD, and dissociative subtype of PTSD. Tonic immobility possibly increases risk for PTSD uniquely, and evolution-prepared dissociation may not bear a relationship to any posttraumatic sequelae.

The phenomenological differences between these clusters of peritraumatic dissociation will be illustrated in the following chapter using reported first-hand accounts of traumatic experiences in the literature. The subjective experience associated with each theorized cluster will be illustrated via excerpts to portray the distinct phenomenology and characteristics of the traumatic event correlated with evolution-prepared dissociation, tonic immobility, and clinical peritraumatic dissociation.

Chapter 4: Application of the Theory

This chapter presents first-hand accounts of traumatic experiences that were available online or as published literature, and use these accounts to illustrate the key differences between the subjective experiences of evolution-prepared dissociation, tonic immobility, and clinical peritraumatic dissociation. The phenomenology of these experiences and the types of events eliciting such reactions are highlighted and compared with one another to support the argument that these integrated systems of defense represent distinct responses.

Examples of Evolution-Prepared Dissociation

Many examples of evolution-prepared dissociation have emerged from collected accounts of life-threatening accidents (falls, near-drowning, motor vehicle accidents, animal attacks, etc.). For instance, Albert Heim (1892) gathered subjective observations of survivors of falls in the Alps mountain range. He noted that the responses of these survivors were remarkably similar:

No grief was felt, nor was there paralyzing fright of the sort that can happen in instances of lesser danger (e.g., outbreak of fire). There was no anxiety, no trace of despair, no pain; but rather calm seriousness, profound acceptance, and a dominant mental quickness and sense of surety. Mental activity becomes enormous, rising to a hundred-fold velocity of intensity. The relationships of events and their probable outcomes were overviewed with objective clarity. No confusion entered at all. Time became greatly expanded. The individual acted with lightening-quickness in accord with accurate judgment of his situation.

(Albert Heim, 1892, pp. 130–131, as cited in Noyes & Kletti, 1980)

This summary of subjective accounts illustrates the absence of emotion, enhanced problem-solving, sense of speeding of mental activity, and temporal distortion that accompanies

events that present extreme threat to life.

The sense of heightened mental acuity and preternatural calm that accompanies evolution-prepared dissociation has been greatly emphasized in existing accounts. Noyes and Kletti depict the experience of Admiral Beaufort, who survived a near-drowning in Portsmouth Harbour in 1975. Beaufort writes, “though the senses were... deadened, not so to the mind; its activity seemed to be invigorated in a ratio which defies all description, for thought rose above thought in rapid succession” (Noyes & Kletti, 1977, as cited in Roberts & Owens, 1988). The experience often appears accelerated, intense, and vivid. In another example, Albert von St. Gallen Heim survived a potentially fatal accident in 1881 in which he was caught in a wagon, and had a remarkably clear stream of calm review of potential consequences of decisions. He writes:

I fell between the front and rear wheels of a wagon traveling between Aosta and St. Remy... I know quite clearly that I let myself fall only after these lightening fast, wholly precise reflections, which seemed to imprint myself upon my brain... several persons have told me quite similar stories. What they reveal is not merely an admirable presence of mind or a simple reflex movement. Much more than that they reflect the dread-endangered utter-most exertion of the human spirit appearing in moments of extreme excitement. (Adams, 1988, pp. 1–2)

Other accounts highlight the sense of extreme calm and physical analgesia during these life-threatening events. Sergeant Nick Alkemade was a pilot in a British bomber who writes about his experience getting shot down in a plane: “I felt a strange peace away from that shriveling heat. As I plunged toward eternity I felt an enjoyment of the cool air rushing over my blistered face” (Adams, 1988, p. 6). The rock climber Edward Whymper fell while ascending the

Matterhorn in 1862. He declared:

I was perfectly conscious of what was happening, and felt each blow, but like a patient under chloroform, experienced no pain. Each blow was, naturally, more severe than that which preceded it, and I distinctly remember thinking, 'Well, if the next is harder still, that will be the end!' Like persons who have been rescued from drowning, I remember that the recollection of a multitude of things rushed through my head, many of them trivialities or absurdities which had been forgotten long before; and more remarkable, this bounding through space did not feel disagreeable. (Adams, 1988, p. 13)

In yet another example of this sense of remarkable calm and serenity that dominates the experience of severe threats to life, a motorist who accidentally drove off a cliff in the mid-1950s writes, "I felt very little emotion about my approaching death. In fact, I was like a third person looking on. My body would be killed, and I would stand by and watch; a curious onlooker" (Adams, 1988, pp. 48–49).

Other perceptual distortions that have been documented during evolution-prepared dissociative experiences include attention narrowing intensely to relevant stimuli in the environment, absence of sense of hearing, the sense of automaticity, and temporal distortion. An excerpt that illustrates these phenomena was written by a policeman who had fired on a man who was threatening to kill his partner. He writes:

When he started toward us, it was almost like it was in slow motion and everything went into a tight focus... When he made his move, my whole body just tensed up. I don't remember having any feeling from my chest down. Everything was focused forward to watch and react to my target. Talk about an adrenaline

rush! Everything tightened up, and all my senses were directed forward at the man running at us with a gun. My vision was focused on his torso and the gun. I couldn't tell you what his left hand was doing. I have no idea. I was watching the gun. The gun was coming down in front of his chest area, and that's when I did my first shots.

I didn't hear a thing, not one thing. Alan had fired one round when I shot my first pair, but I didn't hear him shoot. He shot two more rounds when I fired the second time, but I didn't hear any of those rounds, either. We stopped shooting when he hit the floor and slid into me. Then I was on my feet standing over the guy. I don't even remember pushing myself up. All I know is the next thing I knew I was standing on two feet looking down at the guy. I don't know how I got there, whether I pushed up with my hands, or whether I pulled my knees up underneath. I don't know, but once I was up, I was hearing things again because I could hear brass still clicking on the tile floor. Time had also returned to normal by then, because it had slowed down during the shooting. That started as soon as he started toward us. Even though I knew he was running at us, it looked like he was moving in slow motion. Damnedest thing I ever saw. (Gladwell, 2005, pp. 223–224)

Many of the preceding examples mentioned thus far have included life-threatening experiences that were not interpersonal in nature (not perpetrated by another human). However, examples of defensive reactions consistent with evolution-prepared dissociation can be found in literature documenting experiences of sexual assault. This is particularly the case when a person during assault is frightened for his or her life. In one memoir of a woman writing about her

recovery from PTSD after a man had broken into her house and raped her, the woman felt afraid that she was going to be killed. She writes about her experiences during the rape:

There was nothing familiar or clichéd about those moments on the edge of death.

My life did not pass before me in a flash. It took the time it took, but time was altered, becoming deep and broad, my consciousness radically inflated like a parachute, slowing down time by expanding my use of it, giving me access to many levels of perception and interpretation at once. (Francisco, 1999, p. 18)

When she began listening to what she called an “inner voice,” she remarked:

It removed panic and any need to weigh alternatives. I knew exactly what to say and do, moment by moment, at the level of muscle tension and tone of voice. I began to concentrate. I lit up like a room-size computer in a 1950s horror movie, lights blinking, wheels turning. *On.* (Francisco, 1999, p. 18)

Francisco’s experience of temporal distortion and expansion of time and consciousness, enhanced perception and ability to concentrate, and automaticity resembles experiences depicted by those surviving accidents and non-interpersonal life-threatening traumatic events. The direct threat to Francisco’s life and her corresponding fear may have been crucial in eliciting evolution-prepared dissociation as one element of a package of defensive reactions, instead of clinical dissociation, which would not have facilitated physical survival.

In a blog format, Dell (2010a; 2010b) invited readers of the blog to contribute first-person accounts of their peritraumatic dissociation responses, after blogging about the distinction between evolution-prepared dissociation and more neocortex-based clinical dissociation. Several readers commented with lucid accounts distinguishing their evolution-prepared dissociative responses during life-threatening events from their familiar

clinical dissociation symptoms. One reader commented:

I have also had fight or flight experiences where a potential deadly assault could have happened, but my steadiness and ability to think on my feet (yes, time did seem to stand still) helped me to avert the assault, although it was a slightly out of body experience with time slowing to a snail's pace. This occurrence was much different than my chronic dissociation when at times, I have lost huge blocks of time. (Susa (Art Cathartic on FB), 2010)

Another reader remarked on how different evolution-prepared dissociation felt to her than clinical dissociation:

Evolution-prepared dissociation—so that's what it's called. I would never have thought to call it that. It doesn't feel like dissociation at all. In fact, it feels—to me—like the opposite. Like everything in you is *right there*. And the world is slow but your mind is fast. And you're chewing through incoming information faster than you ever have before. And everything is ok, not because it's not terrifying but because you aren't in the future or the past, but the present, the absolute present, and so there's no time for ok or not ok. Everything just is... So perhaps I'm thinking of the whole of the organized response, rather than the one piece. Even so, it's not at all like what I think of as dissociation at all. When I think of dissociation, I'm thinking of "... the chronic dissociation of persons with posttraumatic and dissociative disorders." And that feels very different to me (Holly Gray, 2010).

Another contributor to the blog compared her experience falling about 12 feet to the ground while playing in a barn to her persisting dissociation symptoms:

While in the process of falling and for a few seconds afterwards, I felt intensely focused, my thoughts were clear, I was super aware of my body, seemed to have super reflexes and control, and felt very clear, powerful energy...

That's pretty much the opposite end of the spectrum compared to what I experience that my therapist has identified as dissociation. From my perspective, in the "dissociation" my thoughts slow or seem to stop; my awareness and senses may be dulled or interrupted; and my energy seems to fade away.

(dissociationstation, 2010a)

Overall, it seems clear that individuals experience evolution-prepared dissociation primarily in situations where the associated perceptual distortions would enhance survival (such as directly life-threatening events), and that the subjective experience of this kind of peritraumatic dissociation is very different from clinical peritraumatic dissociation.

Examples of Tonic Immobility

Although tonic immobility appears to occur in similar situations that evoke evolution-prepared dissociation, there are some distinctions in their respective phenomenological experience. Much of the research on tonic immobility in humans has centered around experiences of sexual assault, where the central experiences of entrapment and fear for life are frequently felt at the same time, thus evoking tonic immobility. Statements such as "I felt faint, trembling and cold... I went limp" (Burgess & Holmstrom, 1976, p. 416) depict the unique physiological manifestations of tonic immobility. For example, Ms. Murray's account of her sexual assault illustrates paralysis and other physiological phenomena. She was a 27-year-old college junior when she was raped by a stranger that had come to her door and introduced himself as a friend of a friend. After letting him in the house and conversing with him briefly,

Ms. Murray describes the following interaction:

Finally he grabbed me. I was really pissed at that point and started fighting. I realized right then that he wasn't going to let me go, that he was totally serious about what he was talking about, and I started struggling. He started hitting me around the face and yelling at me and telling me I had better do what he said. At that point I completely froze. I was so frightened. This wasn't a simple thing of verbal sexist statements being made to me. This was really an attack on me, and I became totally frightened, and just froze up. My body went absolutely stiff. I was bent over holding my head because he had been hitting me in the face. He picked me up and threw me into my bedroom, which was right off the kitchen. At this point I couldn't even scream... I was afraid to fight anymore with him, and so I was just laying there, completely stiff and numb. (Russell, 1974, pp. 233–234)

Another example can be seen in the account of a woman who had been kept prisoner by a man who repeatedly tortured and raped her:

I felt that I was outside my body, watching this whole thing, that it wasn't happening to me, it was happening to someone else. It was a strange feeling, utterly unreal. I was terrorized, but it's very hard to describe the shock of what was happening. At first, I went into a state of shock where I just shook and shook and shook and shook and shook. And I was freezing cold. Just freezing cold. And he kept the gun on me all the time. (Russell, 1974, p. 19).

In another documented account of sexual assault, a woman was raped by a stranger while she was alone in a laundry room:

I went numb. It was the kind of shock your body goes into when you think you're

alone and somebody jumps out of a corner and yells, “Boo.” You freeze, then there’s the relief when you realize some clown is just trying to scare you.

I remember being surprised to see that he was shorter than me, and I was thinking I should be able to defend myself. But I didn’t do anything. My body felt paralyzed. I guess I had trouble comprehending that it was really happening to me. (Schultz, 1974, p. 14)

One of the most frequently cited examples of tonic immobility is from the Scottish missionary and explorer of Africa, David Livingstone, who was attacked by a lion that crushed his shoulder:

I heard a shout. Starting, and looking half round, I saw the lion just in the act of springing upon me. I was upon a little height; he caught my shoulder as he sprang, and we both came to the ground below together. Growling horribly close to my ear, he shook me as a terrier dog does a rat. The shock produced a stupor similar to that which seems to be felt by a mouse after the first shake of the cat. It caused a sort of dreaminess, in which there was no sense of pain nor feeling of terror, though quite conscious of all that was happening. It was like what patients partially under the influence of chloroform describe, who see all the operation, but feel not the knife. This singular condition was not the result of any mental process. The shake annihilated fear, and allowed no sense of horror in looking round at the beast. This peculiar state is probably produced in all animals killed by the carnivora; and if so, is a merciful provision by our benevolent Creator for lessening the pain of death. (Livingston, 1857, p. 12, cited in Freyd, 1996, p. 66)

These examples depict the profound sense of immobilization, as well as reduced body temperature, shaking/trembling, numbness, fear for one's life, and out of body experiences, that accompany the terror associated with certain kinds of traumatic experiences. These accounts differ from those portrayed by those who experience evolution-prepared dissociation, as tonic immobility is accompanied by intense fear, inability to initiate defensive action, and other physiological phenomena that is distinct from evolution-prepared dissociation.

Examples of Clinical Dissociation

First-hand accounts of clinical dissociation that occurs during traumatic events reveal experiences that are remarkably different and often entirely contrasting to evolutionary-derived and subcortical peritraumatic dissociation. These accounts depict dulled or foggy senses, "going away," increased hypnotic focus on internal imagery or extraneous details, or otherwise reduced awareness of the environment or circumstances of the trauma.

In a personal account of recovery from severe and chronic abuse in childhood, Tolson (2003) describes the overarching themes of dissociation during trauma for many individuals:

Dissociation, which gives rise to a form of temporary transcendence, is one of the major defense mechanisms resorted to by traumatized children. The mind or spirit leaves the body and the child may come to feel no pain, may leave the scene entirely, neither experiencing the abuse at the time nor remembering it afterwards. The escape from the self—from what is being done to the self—creates a safer space, a retreat. It may be temporary or longer-lasting, depending on the severity and frequency of abuse. The responses of others help shape the meaning of the experience, and the possibilities for either integrating the experience or rejecting it, for either dealing with it in the present or putting it aside to deal with later. (p.

167)

Tolson also notes that individuals who use this kind of “defense mechanism” repeatedly, especially in childhood, begin to entrain themselves to respond to pain in this manner, resulting in persisting dissociation. Tolson continues to describe the experience of survivors of childhood sexual abuse:

Many survivors of childhood sexual abuse have described the experience of becoming observers of their own abuse, of symbolically leaving their bodies and watching the enactment of abuse from another place, for example, from the ceiling or through a window. This figurative flight may protect them from abuse that might otherwise be impossible to experience and recover from, given the psychological meanings for the self. (Tolson, 2003, p. 167)

Tolson describes the common psychological phenomena of “out of body” experiences, “leaving the scene,” or otherwise escaping the self in favor of a “safer place.” For many, this kind of dissociation takes the form of absorption into “the void” or “the blackness,” where one is focused on nothing in particular. For example, Ross documents the story of one woman with a history of severe childhood trauma. She described her reaction to her mother’s physical, psychological, and emotional abuse:

At first I defended myself which lead to physical violence. To avoid this I would “go away” in my mind. When I dissociated I could tune everything out until it became too intense to block. Ignoring her escalated her anger. If I fell asleep she would wake me and begin the accusations all over again. (Ross, 2007, p. 287)

The degree of this woman’s peritraumatic dissociation was so intense that she could achieve sufficient distance from the traumatic occurrence to fall asleep. This had the subjective

sense of “going away.” The same woman stated that she could enter “a trance-like dissociative state causing her [mother’s] words to fade far into the distance” (Ross, 2007, p. 287).

In another example of distancing oneself mentally and physiologically from trauma, Bailey writes about his experience of recovery from repeated sexual abuse by a Catholic priest named Neary:

As Neary continued in his sexual abuse of me, I developed a mental place I would go to. He could take my body, but my mind was mine and mine alone, unreachable by his violations of my little boy’s body. I became a little numb at his arrival and adopted the attitude to just withdraw and not resist anymore, to let him do his thing, and, that way, it would be over faster. It worked. He did his thing and I withdrew to a safe place in my mind, and then it would be over. He seemed to know that I had given in, but he never let it show, and he was still having the time of his life, back there, behind me, as I was transported elsewhere. My mind was mine, all mine.

I used to feel that if I took this to my grave, if I kept my dirty secret, then it would be for the best. I felt that if I told anyone about it, then Rev. Neary had won on the last front, because my mind was the only place he couldn’t violate. (Bailey, 2006, p. 92)

Bailey writes that his abuse primarily occurred when he was 10 years of age. As an adult, he suffered from severe PTSD symptoms, including nightmares, flashbacks, chronic feelings of shame and guilt, disruption in spirituality and his relationship with God, and suicidal ideation.

In another example, a woman writes about her experience while being raped by a man who had broken into her house:

The easiest thing to do is to leave. Let my body stand in for me. As I write this, it sounds like a decision, but it happened instinctively, as one swerves just soon enough to avoid the crash. These are not willed acts of survival. We are in some way assisted, led away from what can only harm us. (Francisco, 1999, p. 28)

Later, she remarks:

I remember this moment from a spot up near the ceiling through a consciousness separated from the bodies below. As a result, my memory has a quality of dreamy calm that I want at times to rip away. Only years later, when I learned to retrieve a bodily memory of this night, did I finally experience some of the details. (Francisco, 1999, p. 28)

In contrast to “going away” or subjectively absorbing their attention in nothing, other individuals escape into an internal world or focus on details of the surroundings that are irrelevant to the trauma or abuse. For example, Stecker describes the story of a woman who recovered from PTSD after being sexually assaulted by her coach:

It’s also hard for me to recall any specifics of what happened next, except I can tell you the courts were blue. I remember saying to myself that the courts were blue and I remember focusing on them. I told myself to look at the blue-surfaced courts. I know I was raped. I was raped by that coach on a blue-surfaced tennis court the day I cheered Bruce. I was thirteen years old. The entire thing was sudden and violent. (Stecker, 2011, p. 18)

In another instance, a woman named Liz recalls her mental escape during an instance of sexual abuse:

I remember being on the bed and he was laying on top of me. And I had my hands

stretched out. And I was touching the wallpaper. And it was that flecked wallpaper, you know, the kind with the white stuff with gold specks, and just feeling it... I was trying to focus on it... rather than on... yeah I [was] dissociating. (Tolson, 2003, p. 167)

In this example, Liz had experienced physical abuse from a father who became violent after a brain tumor, in addition to sexual abuse between the ages of 6 and 12. She writes that she mostly forgot this abuse until she graduated from college and experienced a flood of memories. In both these examples, the primary experience is of absorbing one's attention into an aspect of the environment that is unrelated to the trauma (for the woman in the former example, it was the blue courts, and for Liz, it was the flecked wallpaper). These experiences are noteworthy for their phenomenological similarity to absorption. Further, it is clear that these responses would *not* be adaptive in situations of life-threatening danger in which enhanced awareness of details of the traumatic event would be required for maximizing chances of escaping the situation alive.

Another mode of response that constitutes clinical peritraumatic dissociation includes significant changes in perception of sight, sound, smells, or pain that facilitates distance from the event. These alterations of consciousness resemble hypnotic phenomena. Gelinas writes about this capacity for modifying sensory experience in a patient who had "taught herself" to induce anesthesia in order not to feel her step-father's physical or sexual abuse:

She was 11 years old at the time and her step-father was squeezing together the four fingers of one of her hands until she cried. She remembered looking straight into his eyes and holding her breath so that this time she wouldn't cry, telling herself not to feel her hand. As she began feeling the pressure of her lack of breath, it became easier not to feel her hand. Later that night, the stepfather came

into the bathroom and asked to see that hand. She put it down on the edge of the sink and he abruptly brought his fist down onto it. The patient states that during the short interval of time between the beginning of his motion and the impact, she had been able to “not feel” her hand. Since that episode she has been able to induce and reinforce anesthesia when she felt she needed it. (Gelinas, 1983, p. 316)

This induction of anesthesia appears comparable to hypnosis-based alleviation of pain. The patient also remarked that she could use this response at will and regularly in order to escape pain in later life, thus linking this kind of peritraumatic dissociation to persisting dissociation.

In another example of distorted perception involving changed sensory experience and numbing, Tolson writes about her experience during an incidence of rape by a family member:

I try to raise my arms, but my body feels like it is frozen within an iceberg. A heavy block of ice is on top of my body, crushing the air out of my chest. There is no space, no room for air. I am too small, the glacier is too large, and my head hits the headboard. To catch a breath, I turn my face to the side. I look to see what I can see. I see feet in socks, toes down, heels up, hanging over the foot of the bed. I see glass doorknobs. I see the closet door... I am too frozen to feel. This can't be happening. I pretend to be sleeping. I pretend to be dead. (Tolson, 2003, pp. 146–147)

It is possible that this excerpt captures the experience of wanting to escape the body and the mind so as not to endure an overwhelmingly traumatic occurrence, rather than actual perceptual distortion. However, phrases such as “too frozen to feel” and feeling her chest being crushed by glacier resemble genuine shifts in sensory experience that potentially make the event

more psychically survivable.

In the commentary on Paul Dell's posts on clinical dissociation, readers reflect about their first-hand experiences with clinical dissociation. One reader suspects that the reduced awareness in the environment that is characteristic of clinical dissociation occurs more pronouncedly when it is in the context of persisting dissociation rather than the original traumatic event:

The more I think about it, the more I have a sense that there are some discernable [sic] patterns as to which effect (i.e., clear, fuzzy, unaware, gone away, out of body, etc.) I might experience under different circumstances. I need to mull this over for awhile. One thing that really just clicked with me is that the "fuzzy" thinking/feeling times seemed to occur more frequently with subsequent similar experiences rather than the initial maltreatment. (dissociationstation, 2010c)

This observation provokes the question of whether clinical dissociation occurs only when the response has been prolonged and entrenched into persisting dissociation, rather than peritraumatically. The study design portion in this dissertation would be suited to address this research question.

In another post, the same reader directly compares her experience of evolution-prepared dissociation and clinical dissociation, positioning them as phenomenologically distinct:

I have observed major differences in the circumstances that seem related to the two distinct types of "dissociation" being discussed in this thread.

Every time I've had the "hyper focus" experience it's been in a situation that was sudden, unexpected, and did not involve harm being caused by a family member.

I've had it happen when a stranger threatened me, but never with a family member. I've had flashbacks on "hyper focus" events but I *knew* what they

were about; I've had gut-wrenching feelings of fear in looking back at the event, but they faded on their own, and telling the tale of the experience to others seemed to help me feel better.

Not so with certain other experiences, where instead of “hyper focus” I felt dulled, slowed, distanced, or at some point completely disconnected. Those are the experiences that seem tied to the “chronic dissociation”. With these there were no joyous moments of realization—*Wow! I lived through that!*—no release of being able to share the experiences with others and learn to laugh about them as adventures survived. On top of that there was long-term fear that the experience was likely to be repeated over and over again, inescapably, possibly getting worse and worse... forever. (dissociationstation, 2010b)

This coherent account of evolution-prepared and clinical dissociation highlights several differences, both in the subjective experience and in the circumstances that elicit such dissociation. Evolution-prepared dissociation occurred in response to unanticipated traumatic events that were not perpetrated by family members, and were characterized by intensified focus. In contrast, clinical dissociation occurred in response to abuse by family members and resulted in both fear of repeated victimization and the feeling of dullness or disconnection.

Summary

In this chapter, the theory of divisions of peritraumatic dissociation into evolution-prepared dissociation, tonic immobility, and clinical dissociation were applied to documented accounts of traumatic experiences to illustrate the contrasting phenomenology of these clusters of peritraumatic dissociation, as well as the context, eliciting situations, and associated factors unique to each cluster.

In these first-hand accounts, evolution-prepared dissociation solely occur in situations where the perceptual distortions could *enhance* chances of survival. These were circumstances that were life-threatening and in which mobilization of some action on the part of the individual would increase likelihood of survival. Further, the perceptual distortions increase awareness of the environment, speed of processing, or mental clarity. This is congruent with its purpose of facilitating survival, as opposed to psychological dissociation that induces a feeling of dulled senses or fuzziness.

Tonic immobility similarly occurs in situations where the individual believes there is a threat to life. However, tonic immobility (as opposed to evolution-prepared dissociation) is elicited when enhanced perception of the environment would not aid the chances of survival because of a sense of entrapment or lack of options for behavioral strategies that would increase chances of survival. Thus, the experience of tonic immobility, being the “end of the line” of physiological and behavioral systems of response designed to deal with threat, evokes different kinds of phenomena that are adaptations for these contexts, including paralysis, a sense of coldness, shaking/trembling, and numbness.

Clinical dissociation has been contrasted to dissociative adaptations that enhance perception of the environment with its phenomenology of perceptual *distancing* from the situation through intense absorption in nothingness, in extraneous stimuli, or hypnotic alteration of sensation. Individuals who have experienced clinical dissociation identify that it becomes a chronic pattern of response after the initial trauma, and also seems to occur more frequently with interpersonal and repetitive trauma. Clinical peritraumatic dissociation manifests in situations in which enhanced perception of environmental stimuli would not benefit a person’s chances of survival (such as in non-life threatening events), and particularly experiences that are

psychologically painful or overwhelming. In these situations, clinical dissociation causes psychological numbing and the “fuzziness” of senses that alleviates psychic pain.

Chapter 5: Research Design

This proposed study is a comprehensive quantitative research design to delineate clusters of peritraumatic and persisting dissociation, associated characteristics, and posttraumatic sequelae. Such delineation provides a foundation for understanding possible underlying clusters of peritraumatic dissociation with contrasting phenomenological manifestations. It also aims to clarify the presently poorly understood relationship between peritraumatic dissociation and PTSD symptomatology.

Proposed Study Procedure

In order to address the stated research questions, I will construct one research instrument from multiple existing measures addressing peritraumatic dissociation. These measures and associated items, including newly developed items, will be selected to maximally incorporate all peritraumatic dissociative experiences that have been identified in the literature and first-hand accounts. I will develop a research design involving: (a) administering these measures to a sample of trauma survivors and submitting the data to exploratory factor analysis to model the structure of correlations among items; (b) computing composite scores based on the factor loadings of the items and submitting these composite scores along with other variables to a cluster analysis to identify clusters of peritraumatic reactions in subgroupings of participants and patterns of characteristics associated with these clusters; and (c) conducting a multiple regression analysis that will investigate the degree of variability in PTSD symptomatology that can be predicted by each composite score calculated from the factors emerging from the factor analysis.

Participant Recruitment

A minimum of 200 participants will be invited to participate in this study. Although there are no defined rules for number of required subjects because the minimum number will depend

on the quality of the data, some researchers have offered varying guidelines. For example, Gorsuch (1983, as cited in Stevens, 1986) states that a factor analysis should include a minimum of 4-5 participants per measure item in order to achieve adequate stability in the factor solution. Fabrigar and Wegender (2012) recommend that under moderately good conditions (communalities of .40 to .70 and at least three measured variables loading on each factor), a sample of 200 should be adequate. This sample size is more than adequate for achieving statistical power of 0.80 ($\alpha = .05$) to detect a medium effect size for the anticipated multiple regression element of this study (Cohen, 1992). Although there are also no firm rules dictating the number of participants required for a cluster analysis, it is generally recognized that factor analyses tend to demand more subjects than cluster analyses, as the latter is often recommended as a procedure in the case that a researcher does not have an adequate sample size for factor analysis (Henry, Tolan, & Gorman-Smith, 2005).

Van der Hart et al. (2008) noted in a critical review that limited research has been conducted on individuals seeking mental health treatment for trauma-related symptomatology, and that the sample characteristics may influence the strength of the relationship between peritraumatic dissociation and PTSD. In addition, it was recommended that future research on the relationship between peritraumatic dissociation and PTSD should focus on clinical populations that have both survived various kinds of childhood abuse and also abuse in adult life (Lensvelt-Mulders et al., 2008). There has been limited research on this association when the traumatic stressor occurred as a result of childhood abuse. In an effort to expand the body of literature involving various clinical samples of trauma survivors, study participants will be recruited through settings that provide mental health treatment. To qualify for recruitment, participants must have experienced a traumatic incident (defined by Criterion A of PTSD) in the

DSM-V in their lifetimes. Participants must also be at least 18 years of age. Disqualification is warranted if the person was intoxicated at the time of the traumatic event, which would cause alterations of consciousness and dissociative-like states unrelated to peritraumatic dissociation (Good, 1989).

Ethical Considerations

All participants will be clearly informed of their rights and of the research goals through IRB-approved informed consent forms. Participants will be informed of the potentially sensitive nature of the questions asked and the possible risks of participating. The researcher will offer participants the chance to withdraw from the study at any point during data collection. If necessary, a clinician could be present during data collection to observe the emotional reaction of the participant or to offer access to support for those who need additional services. Identifying information will not be associated with participant data.

Time Discriminants of Peritraumatic Dissociation

The temporal dimensions of peritraumatic, persistent, and chronic dissociation will be defined as follows: peritraumatic dissociation occurs during or immediately following (up to 24 hours) a high magnitude stressor, persistent dissociation begins 24 hours after and persists for more than two weeks following a traumatic event, and chronic dissociation continues for years after a stressor (Waelde, Silvern, Carlson, Fairbank, & Kletter, 2009).

Measures

A composite instrument will be constructed from select questions from each of the following measures: Peritraumatic Dissociation Experiences Questionnaire, Tonic Immobility Questionnaire (Abrams et al., 2009), Clinician-Administered Dissociative States Scale (Bremner et al., 1998) and the Somatoform Dissociation Questionnaire—Peritraumatic (Nijenhuis et al.,

2001). All documented major dissociative reactions during trauma were collected from existing literature and displayed in Table 2, which lists corresponding questions from each existing measure of dissociation that will assess the reaction. Redundant items across measures were eliminated to lessen the burden on study participants, as repetitive items provide little new information. Further, I will develop questions assessing the peritraumatic reactions that were not evaluated by any existing measure of peritraumatic dissociation. These symptoms for which questions will be newly developed are listed in Table 2. Given that measures of dissociation will only yield analysis results for reactions that the measures directly assess, it was critical to include *all* possible dissociative reactions that may occur peritraumatically in order to most comprehensively evaluate the factor and cluster structure of these experiences.

Table 2

Peritraumatic Dissociation Reactions and Corresponding Measure Items

	CADSS	PDEQ	TIQ	SPD—P	Other
Time slowing down		3			
Time speeding up	13				
Objects appearing cloudy/fuzzy					X
Things seeming hyperreal					X
Enhanced senses					X
Eyesight smaller than usual (as if looking through a tunnel)				2	
Sounds disappearing or appearing stronger than expected	16				
Feeling something happening to someone else happen to you		7			
Out of body experience/watching from afar		5			
Body or part of body was numb				6	
Absence of emotion					X
Impaired concentration					X
Mental clarity					X
Enhanced problem-solving					X
Things seeming unreal		4			
Confusion		9			
Disorientation		10			
Escape into visual imagery					X
Absorption into “the void” or “the blackness”					X
Feeling hazy or far away from surroundings					X
Feeling as if one is on autopilot		2			
Feeling disconnected from one’s body or that one’s body is changed	6	6			
A body or part of one’s body feels				3	

	CADSS	PDEQ	TIQ	SPD—P	Other
as if it has disappeared					
Others looking motionless, dead, or mechanical	8				
Spacing out or losing track of what is going on		1			
Experiencing self as if strange					X
Having amnesia for large portions of the event		8			
Frozen/paralyzed			4		
Feeling faint			12		
Being unable to vocalize			8		
Feeling cold			9		
Feeling weak			5		
Having trouble keeping one's eyes open			11		
Tensing up and becoming immobile				7	
Having to vomit				8	
Body moving in ways that felt uncontrollable				9	
Losing appetite or thirst				10	
Losing all or some taste sensation				5	

Note. These dissociative reactions were collected from existing literature to represent as many peritraumatic dissociation experiences as possible for inclusion into factor analysis. The item number of the measure assessing each reaction is listed. Reactions that are not evaluated by existing measures will be assessed by newly developed items. The reactions necessitating newly developed items are marked in the column labeled “Other.”

The composite instrument will have 38 items, and will give completion instructions that closely resemble the instruction of the original three measures. In evaluating peritraumatic reactions and attributes of the traumatic event, participants will be asked to rate characteristics of the event that they consider to be the most disturbing and/or distressing for them in their lifetime. The measure will inquire about the type of traumatic event for which item ratings are endorsed,

and will ask the participant to choose among the following types of criterion A trauma: serious bodily injury; threat to life from accident, operation, or, illness; combat or military trauma; witnessing others undergo trauma; physical abuse; threat to integrity of body from another person (including being targeted in a criminal event, experiencing intense pain, or undergoing bizarre punishment); and sexual abuse. These trauma categories were adapted from the Traumatic Experiences Checklist, which will also be administered to evaluate the nature of the trauma. Persisting dissociation will be assessed using the Multiscale Dissociation Inventory (Briere, 2002). Frequency of depersonalization experiences will be measured using Dixon's depersonalization questionnaire (Dixon, 1963) for the purpose of identifying the presence of primarily dissociative PTSD. The presence and severity of PTSD symptoms will be assessed using the PTSD Checklist—Civilian. Peritraumatic and persisting dissociation will be assessed prior to PTSD symptoms to avoid retrospective overendorsement.

Peritraumatic Dissociative Experiences Questionnaire (PDEQ). The PDEQ was developed by Marmar, Weiss, Metzler and Delucci (Marmar, Weiss, & Metzler, 2004) to study the risk that peritraumatic dissociation carries for development of chronic PTSD. The self-report PDEQ, which will be used in this study, contains 10 items rated on a 5-point Likert scale ranging from 1 (not at all true) to 5 (extremely true). It assesses retrospective experiences of depersonalization, derealization, amnesia, out of body experience, and altered time perception (Marmar et al., 1994). The PDEQ has been demonstrated to be internally consistent and reliable, with good convergent, discriminate, and predictive validity (Marmar et al., 2004). The majority of studies in a critical review of 53 empirical studies on the relationship between PTD and PTSD used a version of the PDEQ (Van der Hart et al., 2008). Its items were derived from reactions to civilian catastrophe (P. Dell, personal communication, February 20, 2011), and it was initially

used to evaluate responses to military/combat, civilian, or disaster trauma (Marmar et al., 2004). In order to keep the scale of each measure of peritraumatic dissociation consistent in the aggregate measure, it will be necessary to change the wording of the 5-point Likert scale to range from 1 (not at all) to 5 (extremely). All items from the PDEQ are included in the composite instrument (see Table 2 for more information).

Tonic Immobility Questionnaire (TIQ). The TIQ emerged in response to the earlier-developed Tonic Immobility Scale (Fusé et al., 2007), and was designed to broaden the scope of assessment from rape and sexual assault to a wide range of traumatic events (Abrams et al., 2009). The TIQ contains 12 items regarding experiences during a traumatic event measured on a 5-point Likert scale ranging from 0 (not at all) to 4 (very much), as well as 11 additional questions about the nature of the event, the tonic immobility episode, and substance use during the event. Its psychometric properties are as yet undetermined (Abrams et al., 2009). In order to keep the scale of each measure of peritraumatic dissociation consistent in the aggregate measure, it will be necessary to shift the 5-point Likert scale to range from 1 (not at all) to 5 (extremely). TIQ items that will be included in the composite instrument are 4, 5, 8, 9, 11, and 12 (see Table 2 for more information).

Clinician-Administered Dissociative States Scale (CADSS). The CADSS is specifically a measure of dissociative states, rather than generalized dissociative tendencies (such as the DES). It consists of a 27-item scale with 19 subject-rated items and 8 items scored by an observer. The CADSS has been determined to have good interrater reliability, high internal consistency across all items, and good construct validity as indicated by its relationship with the DES (Bremner et al., 1998). The subjective component of the measure is usually administered and read out loud by a clinician, who begins each question with “at this time,” and asks the

person to rank his or her experience according to a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely). In order to keep the scale of each measure of peritraumatic dissociation consistent in the aggregate measure, it will be necessary to shift the 5-point Likert scale to range from 1 (not at all) to 5 (extremely). Further, the instruction will be changed to “at the time” at the beginning of each item, to indicate that the person should endorse the items according to their experience during the most distressing event of their lives. CADSS items that will be included in the composite instrument are 6, 8, 13, and 16 (see Table 2 for more information).

Somatoform Dissociation Questionnaire—Peritraumatic (SDQ—P). The SDQ—P is a newly constructed self-report measure that assesses somatoform dissociation. It contains 11 items measured on a 5-point Likert scale ranging from 1 (not at all) to 5 (extremely). Its items were discerned from clinical observations, reports in the literature, and key items from the SDQ—20, which assesses the severity of ongoing somatoform dissociation (Nijenhuis et al., 2001). It has been found to have high internal consistency and convergent validity, as it was strongly correlated with measures of psychological dissociation (PDEQ; Nijenhuis et al., 2001). In a critical review of studies on peritraumatic dissociation, most studies excluded measures that assessed symptoms of somatoform dissociation, neglecting a potentially essential feature of peritraumatic dissociation (Van der Hart et al., 2008). SDQ—P items that will be included in the composite instrument are 2, 3, 5, 6, 7, 8, 9, and 10 (see Table 2 for more information).

Multiscale Dissociation Inventory (MDI). The MDI is a measure of various dissociative responses, yielding six subscale scores: depersonalization, derealization, disengagement, emotional constriction, memory disturbance, and identity dissociation. It contains 30 items rated on a 5-point Likert scale ranging from 1 (never) to 5 (very often). Briere, Scott and Weathers (2005) report that the MDI is psychometrically valid.

Dixon's Depersonalization Questionnaire (DDQ). Dixon developed a 10-item self-report questionnaire that quantifies depersonalization experiences within the past year (Dixon, 1963). It was derived from factor analysis of a pool of 43 items administered to a sample of college students to investigate the incidence of depersonalization in a normal population. The items quantify typical depersonalization experiences on an absolute incidence scale (how many times in total the experience has occurred in the past year), and then converted to a 10-point frequency scale ranging from 0 to 9. The total scale score is the sum of the 10 items.

This measure has been referred to as Dixon's depersonalization questionnaire and abbreviated DDQ by subsequent researchers (Simeon, Guralnik, Gross, Stein, Schmeidler, & Hollander, 1998). It has not been widely replicated or validated (Simeon et al., 1998), but was chosen for inclusion in this study because many depersonalization questionnaires include many more items, and a published questionnaire with fewer items will pose a reduced burden on participants. The DDQ will be administered and submitted for inclusion in the cluster analysis for the purpose of identifying participants with combined depersonalization and PTSD symptoms (indicating the presence of the dissociative subtype of PTSD).

Traumatic Experiences Checklist (TEC). The Traumatic Experiences Checklist is a self-report questionnaire that evaluates the presence of 29 types of potential trauma, including "criterion A" traumatic experiences, as well as emotional abuse, emotional neglect, physical abuse, sexual harassment, sexual abuse parentification, and extraordinary family burdens (Nijenhuis, Van der Hart, & Kruger, 2002). The TEC has high internal consistency, test-retest reliability, and criterion-related validity (Nijenhuis, Van der Hart, & Kruger, 2002). The TEC inquires about demographic characteristics of participants, the degree of impact of certain types of experiences, development information (age at which traumatic events occurred), and

qualitative information about the relationship with perpetrators. Gathering as much information as possible about history of trauma is of significant benefit, as it guarantees a wide variety of potential variables to be entered into clustering algorithms.

PTSD Checklist—Civilian (PCL—C). The PCL (of which the PCL—C is a version that encompasses stressful experiences in a broad range of populations) is a 17-item self-report measure that gives a total severity score of posttraumatic symptoms and can be used for diagnosis and treatment monitoring. The PCL has strong evidence of reliability and validity (Keen et al., 2008).

Statistical Analysis

The data will be analyzed in stages:

1. Exploratory factor analysis will be used to determine underlying factors in the aggregate measure of peritraumatic experience.
2. Cluster analysis will be used to analyze clusters of participants who have experienced trauma.
3. Multiple regression will be used to determine the degree of variability in the severity of current PTSD symptoms that can be predicted from the composite scores obtained from factor analysis.

The demographic characteristics of the population will be displayed in Table 3.

Table 3

Demographic Characteristics of the Sample (N = 200)

Variable	N	%
Age (Years) ¹		
18-28		
29-39		
40-49		
50-59		
60 and over		
Sex		
Male		
Female		
Marital Status		
Single		
Married		
Living Together		
Divorced		
Widowed		
Education		
Under 12 years		
13-16 years		
17 years and higher		
Trauma Type Corresponding with Peritraumatic Dissociation Ratings		
Serious Bodily Injury Non- Interpersonal		
Threat to Life from Illness or Accident		
Combat Trauma		
Witnessing Others Experience Trauma		
Physical Abuse		
Threat to Integrity of Body by Another Person		
Sexual Abuse		
Other		

Age at Which First Criterion A Traumatic Event

Occurred (Years) ¹

0 to 4

5 to 8

9 to 12

13 to 16

17 to 24

25 to 34

35 to 44

45 to 54

55 and older

¹ Mean \pm SD

Exploratory factor analysis. Factor analysis is a set of statistical procedures based on the common factor model and is designed to determine how many distinct factors are needed to account for a pattern of correlations among a set of measured variables. It seeks to find common factors, which are unobservable constructs that exert linear influences on multiple measured variables in a battery, with the goal of discerning a parsimonious representation of the structure of correlations between variables (Fabrigar & Wegener, 2012). Factor analysis is useful to address the present research question because although it will determine the number of distinct constructs assessed by a battery of items and what those constructs are, we do not have enough information to test hypotheses about how these constructs causally relate to one another (Fabrigar & Wegener, 2012). Exploratory factor analysis (EFA) was chosen because although the theory of peritraumatic dissociation groupings offers a general idea and some expectation about factors, the theory is not yet sufficiently developed or tested to confidently specify the precise number of factors and which items most highly load onto which factors (Fabrigar & Wegener, 2012). The factors arrived at through factor analysis will not necessarily reflect the measure's "true" or "natural" structure; rather, the goal is to arrive at a meaningful number of common factors that reflects statistical and conceptual usefulness.

The data will initially be tested with the Bartlett's test of sphericity (Pett, Lackey, &

Sullivan, 2003) to determine that the correlation matrix is sufficiently distinct from an identity matrix. To measure sampling adequacy, the data will also be tested with the Kaiser-Meyer-Olkin Test (KMO), which is used to indicate that the sample size is sufficient relative to the number of items in the scale (Pett, Lackey, & Sullivan, 2003). These tests should be found to be statistically significant before proceeding. The correlation matrix, means, and standard deviations for the 33-item aggregate measure will be presented in Table 4.

Table 4

Correlation Matrix, Means, and Standard Deviations of Factor Analysis

Item	1	2	3	4	5	6	...	33	SD
1									
2									
3									
4									
5									
6									
...									
33									

Note. The ellipsis indicates that the table rows and columns will extend to item 33 of the measure.

Factor analysis occurs in two steps: implementation and interpretation. To implement the factor analysis, the data from the aggregate measure will be submitted to a Maximum Likelihood (ML) method. The ML approach is preferred because it offers additional information that will be used to decide the number of factors to retain and to interpret the quality of the factor structure, including indices of model fit, computation of model parameter standard errors, confidence intervals, and significance tests (Fabrigar & Wegener, 2012). Comprehensive Exploratory Factor Analysis (CEFA; Browne, Cudeck, Tateneni, & Mels, 1998) is the recommended statistical analysis package because it will compute the additional information provided by the ML approach, and is useful for providing a wide variety of factoring methods, rotations, and fit indices (Fabrigar & Wegener, 2012). An oblique rotation will be used, which permits common factors to be correlated if correlation improves simple structure (Fabrigar & Wegener, 2012). Correlation between factors is generally a more realistic representation of the data than assuming noncollinearity (Browne, 2001); further, dissociation items were originally meant to measure a single construct and thus items are expected to correlate with each other (Dell & Lawson, 2009). The direct quartimin rotation is an oblique rotation that will be used in this analysis, as it is often

preferred and generally functions well within expected factor correlations (Fabrigar & Wegener, 2012).

Several methods will be used to determine the number of factors to retain. The model fit using the root mean square error of approximation (RMSEA) will be used initially (Fabrigar & Wegener, 2012). The RMSEA determines the appropriate number of factors by specifying a series of models of increasing complexity and generating a statistical index of discrepancy between the model and the data per degree of freedom of the model (Fabrigar & Wegener, 2012). The RMSEA generally performs well, and its use has been recommended in deciding the number of factors (Browne & Cudeck, 1992). It also takes model parsimony into account. A value of RMSEA of approximately 0.05 or less will be considered to indicate a close fit of the model in relation to the degrees of freedom (Browne & Cudeck, 1992), and a RMSEA greater than 0.08 will be considered to be a poor fit (Fabrigar & Wegener, 2012). The scree plot of eigenvalues from the reduced matrix will also be examined to determine the number of eigenvalues that precedes the last major drop on the plot (Fabrigar & Wegener, 2012). This method works well when there are strong common factors. When the scree plot examination and RMSEA model fit converge on a number of factors to retain, it is a good indication that the number of factors is reasonable (Fabrigar & Wegener, 2012). Additionally, the solutions will be examined for conceptual utility and interpretability to determine whether the number of structures appears to capture a factor structure that is theoretically meaningful. The total variance explained by the extracted factors will be displayed in Table 5.

Table 5

Total Variance Explained by the Extracted Factors

Factor	<u>Initial Eigenvalues</u>			<u>Extracted Sums of Squares Loadings</u>		
	Total	% Variance	Cumulative %	Total	% Variance	Cumulative %
1						
2						
3						

Note. This is a sample table with an arbitrary number of factors.

The factor structure will be interpreted by examining the pattern matrix from the oblique rotation (which reflects the actual parameter estimates of the factor loading matrix in the common factor model; Fabrigar & Wegener, 2012), the communality estimates to observe the variance in items accounted for by the extracted factor, and the factor loading matrix to observe how each item loaded on each factor (Fabrigar & Wegener, 2012). Items will be submitted to the criteria identified in Comrey and Lee (1992, as cited in Pett, Lackey, & Sullivan, 2003) to determine if a particular item facilitates the interpretation of a factor according to the degree of shared variance. Loadings of the items in each factor will be examined to determine strength of loadings and degree of correspondence to theoretical constructs. Each final rotated solution should ideally be readily interpretable, and factors will be named according to the underlying theme or construct inherent in each factor. The factor loadings from the rotated structure matrix will be displayed in Table 6, and the factor pattern matrix in Table 7. The factor correlations and alpha coefficients for the factors, along with the means and standard deviations of the items loading onto each factor, are presented in Table 8.

Table 6

Factor Loadings From the Rotated Factor Structure Matrix

Items of Measure	Factors		
	1	2	3
<i>Name of Factor 1</i>			
1			
2			
3			
...			
<i>Name of Factor 2</i>			
1			
2			
3			
...			
<i>Name of Factor 3</i>			
1			
2			
3			
...			

Note. A direct quartimin rotation will be implemented. This is a sample table with an arbitrary number of factors. Underlined values will indicate a double loading on two factors. Loadings highlighted in bold will indicate the factor on which the item was placed. The ellipses indicate that the table rows will extend to the number of items that are deemed to load on the factor.

Table 7

Rotated Factor Pattern Matrix for the Factor Solution

Items of Measure	Factors		
	1	2	3
<i>Name of Factor 1</i>			
1			
2			
3			
...			
<i>Name of Factor 2</i>			
1			
2			
3			
...			
<i>Name of Factor 3</i>			
1			
2			
3			
...			

Note. A direct quartimin rotation will be implemented. This is a sample table with an arbitrary number of factors. Underlined values will indicate a double loading on two factors. Loadings highlighted in bold will indicate the factor on which the item was placed. The ellipses indicate that the table rows will extend to the number of items that are deemed to load on the factor.

Table 8

Factor Correlations and Factor Alpha Coefficients (N = 200)

<i>Factor</i>	<i>SD</i>	<i>1</i>	<i>2</i>	<i>3</i>
1. Name of Factor 1 (<i>n</i> = x)				
2. Name of Factor 2 (<i>n</i> = y)				
3. Name of Factor 3 (<i>n</i> = z)				
Total Scale (<i>n</i> = 33)				

Note. This is a sample table with an arbitrary number of factors. The number of items loading onto each factor are represented in this table by x, y, and z.

¹ Range: 1.00 to 5.00

Calculating composite variables and rationale. The factor structure will be used to construct composite variables representative of the factors and items not well represented by the factor solution. The mean of the items that correlate most highly together and were determined to load on each factor will be calculated and considered to represent a composite variable (one composite variable per factor). If the factor solution did not account for certain variables that did not correlate well with any of the other variables, these items will be retained for inclusion in the cluster analysis. Items that were not well represented by factor analysis should not be dropped from inclusion in the cluster analysis, as these may be the most important pieces of information for the identification of clusters (Dolnicar & Grun, 2008; Frochot & Morrison, 2000; Sheppard, 1996).

The rationale for inputting composite variables into the cluster analysis is derived from balancing downsides of inputting all original items and problems associated with entering factor scores into the cluster algorithm. Factor scores were not chosen as variables in the cluster analysis, as this factor-cluster technique is highly controversial. Arguments against this technique

include assertions that factor analysis change the nature of the data (Sambandam, 2003) or distorts the true structure in the original variable space (Fiedler, 1993); factor analysis prioritizes and assumes homogeneity and “smooths” the data, while cluster analysis functions best with “lumpy data” (Fiedler, 1993; Sheppard, 1996); and the relations of variables to each other are likely changed as a function of factor analysis pre-processing (Ketchen & Shook, 1996, as cited in Dolnicar & Grun, 2008).

However, entering all original items of the aggregate questionnaire is also problematic. Since dissociation questionnaires are designed to measure one construct, the original data is likely to have a high degree of correlation between the variables (collinearity). Collinearity is known to cause the most correlated variables to be more highly weighted than other variables in the determination of the way the variables are clustered (Borden & Barnett, 1987; Fiedler, 1993). This makes it difficult to accurately discern the individual impact of the variables. It also reduces the dimensions or complexity of information, as it lowers the weight of uncorrelated variables in favor of correlated variables that do not add anything unique to the description of the clusters (Sambandam, 2003). Composite scores are suggested to reduced the unevenness of this weighing in the proximity index (Sambandam, 2003). This would combine potentially redundant items that correlate highly with each other and may not help to discriminate among the clusters, as redundant items can mask the clustering that would be present with fewer variables (Milligan & Hirtle, 2004; Sheppard, 1996). Entering fewer variables will also improve ease of interpretability (Everitt, 1979; Frochot & Morrison, 2000).

The means and standard deviations of all variables (both composite and items that did not load highly on any factors) are represented in Table 9.

Table 9

Mean and Standard Deviation of EFA-Derived Variables Included in Cluster Analysis

<i>Composite Variables</i>	<i>SD</i>
1. Name of Factor 1 ($n = x$)	
2. Name of Factor 2 ($n = y$)	
3. Name of Factor 3 ($n = z$)	
4. Additional Variable 1	
5. Additional Variable 2	
6. Additional Variable 3	

Note. This is a sample table with an arbitrary number of factors and variables. The number of items loading onto each factor are represented in this table by x, y, and z. The mean of items loading onto each factor will be taken as a composite variable for inclusion in the clustering algorithm, and the mean of each item not well represented by the factor structure (called “Additional Variable” in this table) will also be entered as variables in the cluster analysis.

¹ Range: 1.00 to 5.00

Cluster analysis. Cluster analysis is a collection of approaches to discovering homogenous groups of people in complex data sets. When utilizing these techniques, it is important to keep in mind that clustering is statistically structure-imposing rather than necessarily discovering something about the natural structure of the world (Everitt et al., 2011; Fiedler, 1993). Depending on the variables entered and the approaches used, there are multiple cluster solutions that may be nearly equally useful. Cluster analysis as utilized in this research design would seek to discover groupings of trauma survivors that have similar kinds of trauma experiences and patterns of peritraumatic or persisting dissociation response.

The variables that are to be submitted to cluster analysis include the composite scores from the factor analysis (including items that were not well represented in the factor structure); sex; age at which first criterion A traumatic event was experienced¹; the incidence and subjective

¹ TEC items that will be considered to reflect potential criterion A traumatic events include 5, 6, 9, 10, 11, 13, 20, 21, 22, 23, 28, and 29.

severity of certain types of trauma experienced over a lifetime, as obtained from the TEC²; type of traumatic event that the participant associated with peritraumatic dissociation ratings; current PTSD symptom severity, as measured by the PCL; presence and frequency of depersonalization experiences, as measured by the DDQ; and types and intensities of persisting dissociation, derived from the scores on each subscale of the MDI. The incidence and severity of lifetime traumatic events is important as a variable considering the theories of sensitization and repetitive stress to the development of PTSD and persisting dissociation, and the postulation that interpersonal trauma (especially by a caregiver) will cluster with clinical peritraumatic dissociation. The rationale for inclusion of these variables is that they are expected to be more likely to be endorsed differently across groups of people, and thus help distinguish clusters. Similarly, age at which first trauma is experienced is included as a variable because the theory outlined in chapter three hypothesizes that trauma experienced at an earlier age will be more conducive to both peritraumatic and persisting clinical dissociation. The six persisting dissociation subscores will be included, rather than one global score, as there may be different patterns of compartmentalization or detachment persisting dissociation that may be discerned from the manner in which the subscales cluster.³ All the variables entered into the cluster analysis and their corresponding associations with clusters are displayed in Table 10.

² TEC items are converted to variables for inclusion in the cluster analysis via the following procedure. The individual items and groups of items that will be inputted as variables include 2; 5; 6; 11; 12; 13; 14–16 (emotional neglect); 17–19 (emotional abuse); 20–22 (physical abuse); 9, 10, 23 (threat to integrity of body, other); 24–26 (sexual harassment); 27–29 (sexual abuse). As part of the TEC questionnaire, each item of the TEC asks whether the experience occurred (yes or no) and for a rating between 1–5 of the impact that the experience had on the participant. For any individual item marked “no,” a value of 0 will be given. For any individual item marked “yes,” the value of the subjective impact from 1–5 will be entered as the variable. For any group of three items: if *any* of the items are marked “yes,” the highest value of “how much did this impact me” of any of the items in that group will be taken; if all of the items in the group are marked “no,” a value of 0 will be given.

³ When interpreting the MDI in the cluster structure, the subscales of depersonalization, memory, disturbance, and identity dissociation may be associated with compartmentalization, and the subscales of disengagement, derealization, and emotional constriction might be considered to represent detachment.

Table 10

Variables and Associated Clusters

	Cluster 1	Cluster 2	Cluster 3
Variable	Name of Cluster 1	Name of Cluster 2	Name of Cluster 3
	n = x	n = y	n = z
<hr/>			
<i>Sex</i>			
Male			
Female			
<i>Age at Which First Criterion A Traumatic Event Occurred (Years)</i>			
0 to 4			
5 to 8			
9 to 12			
13 to 16			
17 to 24			
25 to 34			
35 to 44			
45 to 54			
55 or older			
<i>Trauma Type Corresponding with Peritraumatic Dissociation Ratings</i>			
Serious Bodily Injury Non- Interpersonal			
Threat to Life from Illness or Accident			
Combat Trauma			
Witnessing Others Experience Trauma			
Physical Abuse			
Threat to Integrity of Body by Another Person			
Sexual Abuse			
Other			
<i>Incidence and Severity of Lifetime Trauma¹</i>			
Family Problems			
Serious Bodily Injury Non- Interpersonal			
Threat to Life from Illness or			

	Cluster 1	Cluster 2	Cluster 3
Variable	Name of Cluster 1	Name of Cluster 2	Name of Cluster 3
	n = x	n = y	n = z
Accident			
Combat Trauma			
Second Generation War-Victim			
Witnessing Others Experience			
Trauma			
Emotional Neglect			
Emotional Abuse			
Physical Abuse			
Threat to Integrity of Body by			
Another Person			
Sexual Harassment			
Sexual Abuse			
<i>Current PTSD Symptom Severity</i>			
<i>(PCL)</i>			
17 to 27			
28 to 37			
38 to 47			
48 to 57			
58 to 67			
68 to 77			
78 to 87			
<i>Persisting Dissociation (MDI)</i>			
<i>Subscale Scores²</i>			
Depersonalization			
Derealization			
Disengagement			
Emotional Constriction			
Memory Disturbance			
Identity Dissociation			
<i>Depersonalization (DDQ) Scores</i>			
0 to 14			
15 to 29			
30 to 44			
45 to 59			
60 to 74			
75 to 90			

	Cluster 1	Cluster 2	Cluster 3
Variable	Name of Cluster 1	Name of Cluster 2	Name of Cluster 3
	n = x	n = y	n = z
<i>Peritraumatic Dissociation Scores</i> ³			
Composite Variable 1			
Composite Variable 2			
Composite Variable 3			
Composite Variable 4			

Note. The number of participants that are most closely grouped with each cluster are represented in this table by x, y, and z. The variables sex, age at which a traumatic event first occurred, trauma type corresponding with peritraumatic dissociation ratings, current PTSD symptom severity, and depersonalization score are all reported as a percentage of the number of participants in a given category out of the total number of participants represented in a cluster.

1. Range: 0 to 5.00
2. Range: 5.00 to 25.00
3. Range: 1.00 to 5.00

There are three overarching steps to cluster analysis: measuring proximity, implementing a cluster analysis method, and evaluating and generalizing the clusters (Borden & Barnett, 1987). In the initial stage, the data will initially be standardized by dividing each quantitative variable by its range. This places all variables on the same scale while leaving differences in variances intact (Milligan & Cooper, 1988, as cited in Henry, Tolan, & Gorman-Smith, 2005). The risk of leaving variables unstandardized is that it may introduce large effects into the clustering algorithm due to differences in the variances and means of the variables, an artifact of scaling which should not be in a position to affect cluster differences (Borden & Barnett, 1987). Gower's General Similarity Coefficient will be used as a distance measure, as it is often used for mixed data type of continuous and binary data and categorical variables with more than two categories (Everitt et al., 2011). The binary (yes or no) data will be dummy coded, and the levels categorical data will each be coded with an arbitrary numerical value.

Given the recommendation that multiple approaches be used for the cluster analysis to explore the most meaningful cluster solution out of a number of options (Fiedler, 2003) and to establish cross-method stability of the clusters (Borden & Barnett, 1987), several algorithms will be compared. First, a hierarchical agglomerative approach will be used to estimate the appropriate number of groups, and then a nonhierarchical optimization method will be used to triangulate support for the cluster structure. Hierarchical clustering operates on a proximity matrix and consists of a series of partitions in which an optimal step is sought (Everitt et al., 2011). These methods are widely used and are useful if the researcher is interested in a clustering tree, with smaller clusters arranged successively within larger clusters. Agglomerative methods begin with each individual as a separate group and then merge groups into larger and larger nested clusters (Borden & Barnett, 1987). The average linkage approach (or unweighted pair-group method using arithmetic averages; UPGMA) is considered one of the more sound hierarchical approaches (Aldenderfer & Blashfield, 1984; Borden & Barnett, 1987), is relatively robust (Everitt et al., 2011), and is good at recovering known structures (Milligan, 1981, as cited in Skinner & Blashfield, 1982). Average linkage will be initially used to cluster the data. Average linkage computes an average similarity of a certain variable with all the variables in the cluster, and the next linkage is formed from all pairs of candidates with the lowest average similarity.

To determine the most meaningful number of clusters in this clustering procedure, the “L method” will be used, using a greedy distance metric of the squared distance between each data point and their respective medoid (Salvador & Chan, n.d.). The L method produces an evaluation graph to efficiently determine the number of clusters in a hierarchical clustering algorithm. The x-axis of the graph represents the number of clusters and the y-axis is the evaluation function (metric of distance or similarity). The point of maximum curvature of the graph (the “knee”), is

deemed to represent a reasonable number of clusters (Salvador & Chan, n.d.). Greedy methods compute the evaluation metric by only evaluating the two clusters involved in the current merge, rather than the entire data set (Salvador & Chan, n.d.). As another source of consideration for the ideal number of clusters, Dunn's validity index will be examined (Dunn, 1974, as cited in Everitt et al., 2011). Dunn's validity index is in the range of 0-1, with a value of 1 for completely distinct clustering, and is a criterion for assessing the strength of membership

Rather than accepting the first cluster solution as the final solution, multiple analyses of the data are suggested to triangulate support for the final solution (Borden & Barnett, 1987; Henry, Tolan, & Gorman-Smith, 2005). The number of clusters and initial centers discerned from the average linkage analysis will be entered as input into a nonhierarchical Partitioning Around Medoids (PAM) algorithm. PAM is similar to *k*-means, except that it clusters objects around *k* medoids, where *k* is defined as the number of clusters and is specified in advanced. The advantage of the PAM algorithm is that it is nonparametric, and thus compatible with Gower's General Similarity Coefficient. To evaluate the number of clusters produced by the PAM algorithm, the "jump method" (Sugar & James, 2003) will be used. The jump method appears to be very robust as a nonparametric method to choose the number of clusters to retain. It is based on distortion, which measures the average distance per dimension between each observation and its closest cluster center. When statistically transformed, the distortion curve will exhibit a steep jump at the ideal number of clusters (Sugar & James, 2003). Statistical Package for the Social Sciences (SPSS) can be used for all cluster data analysis.

According to Borden and Barnett (1987), it is not sufficient to apply the clustering algorithms without establishing the reliability of the clusters and capturing the clusters in a conceptual framework of construct validation that has some scientific or practical importance of

the classification. The need for adequate validity of the cluster solution is particularly important given that cluster methods will “find” a cluster solution in any data set regardless of the actual multivariate structure of the proximity matrix (Blashfield, 1980). The reliability of the clusters will be supported by the multiple algorithms used to arrive at the cluster structure. Using hierarchical methods initially and then nonhierarchical clustering using the predetermined number of clusters is a typical strategy in research (Henry, Tolan, Gorman-Smith, 2005). The construct validity of the final solution may be supported by placing the cluster structure in the existing theoretical framework proposed in this dissertation, or explaining differing or unexpected components of the solution with existing literature on patterns of types of trauma, dissociative responding, and PTSD. Further, the multiple regression will be used to compare the degree of variance in PTSD symptom severity that is accounted for by the peritraumatic dissociation composite scores identified from the factor analysis. Given that the composite scores and PTSD symptom severity are variables in the cluster analysis, this is a source of content validity of the cluster structure. This test of criterion-related validity aims to predict variables of interest in ways that are consistent with the theory (Henry et al., 2005).

The number of participants rating characteristics of the trauma and belonging to a particular cluster will be displayed in Table 10. PTSD symptom severity as a function of cluster membership will be displayed in Figure 2; peritraumatic dissociation composite scores as a function of cluster membership will be displayed in Figure 3; persisting dissociation scores as a function of cluster membership will be displayed in Figure 4; trauma type corresponding with peritraumatic dissociation ratings as a function of cluster membership will be displayed in Figure 5; and incidence and severity of lifetime trauma as a function of cluster membership will be displayed in Figure 6.

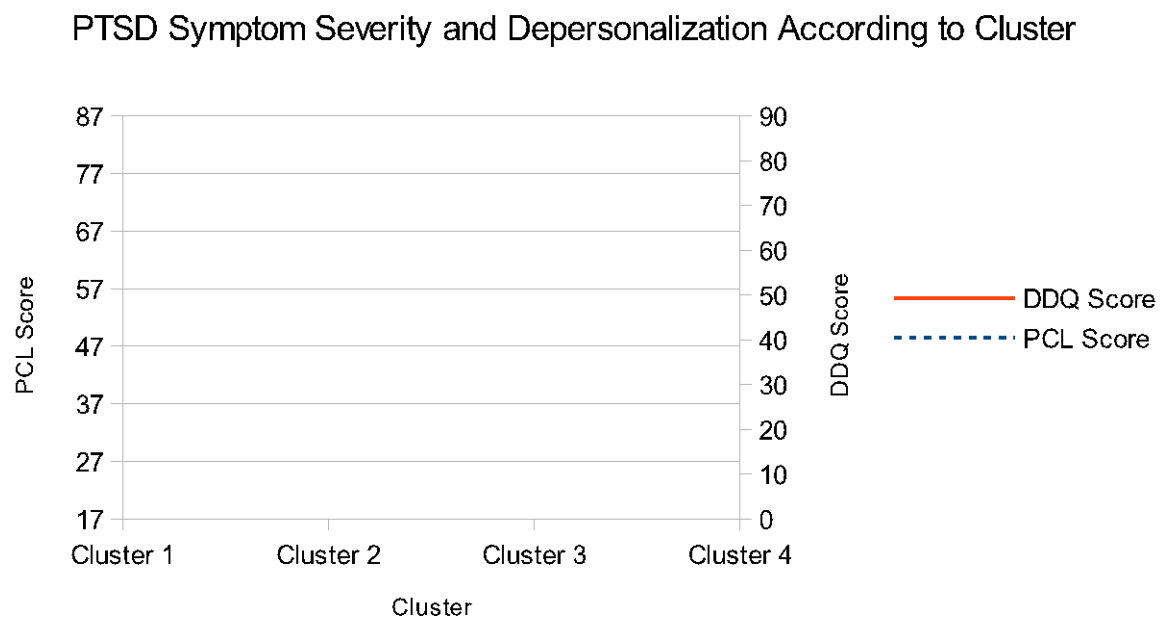


Figure 2. PTSD symptom severity, as determined by the mean score on the PCL, and frequency of depersonalization experiences, as determined by the mean score on the DDQ, corresponding with each cluster. This is a sample figure with an arbitrary number of clusters.

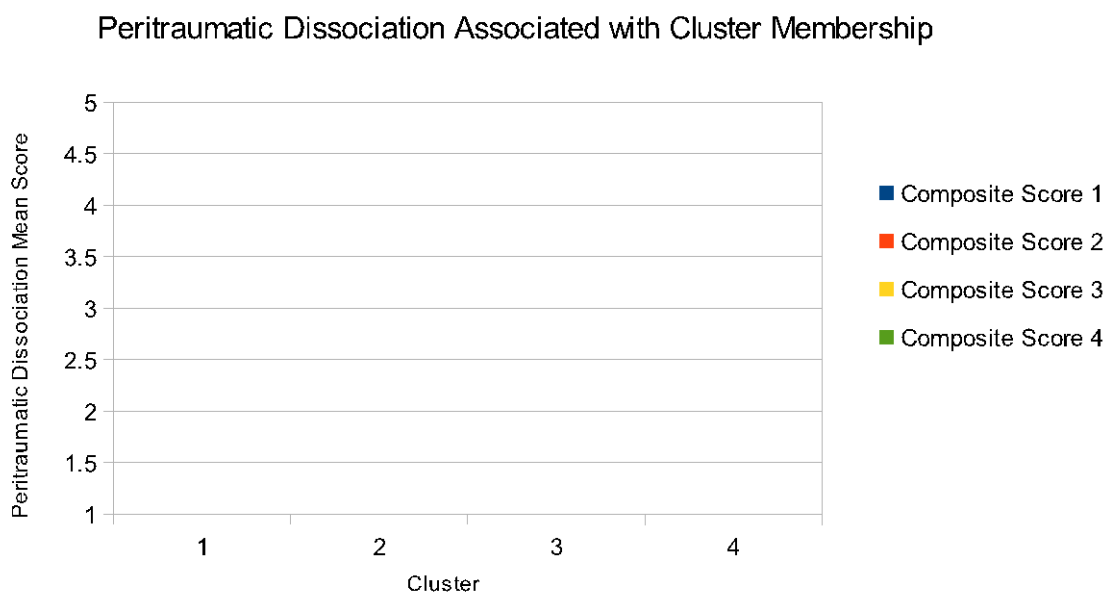


Figure 3. Composite scores of peritraumatic dissociation obtained from the factor analysis corresponding with each cluster. This is a sample figure with an arbitrary number of clusters.

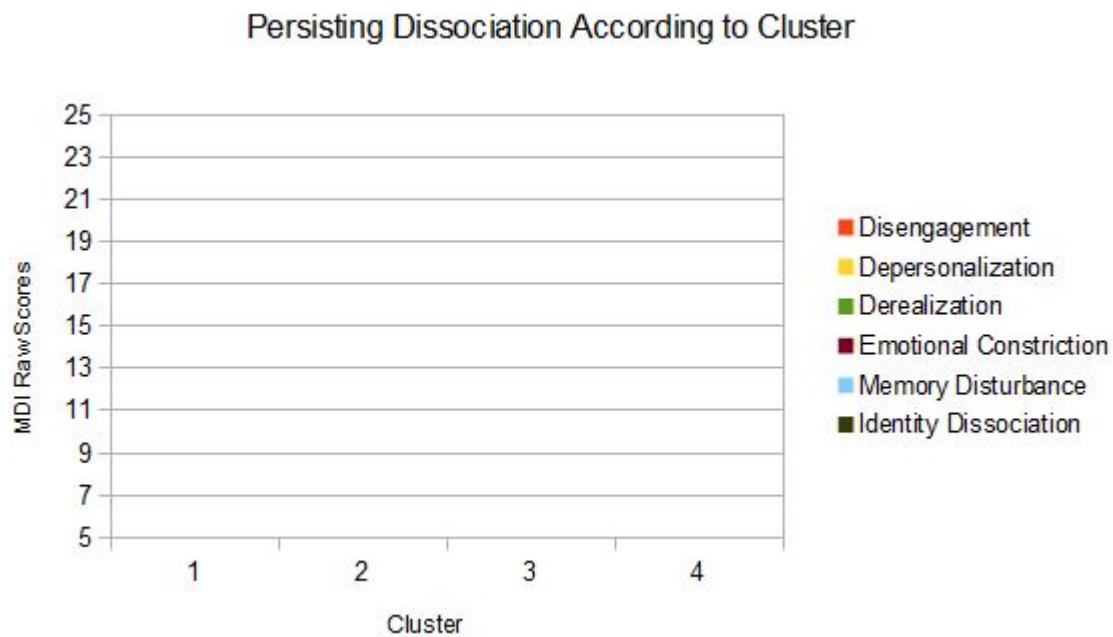


Figure 4. Persisting dissociation, as determined by the mean raw scores on the subscales of the MDI, corresponding with each cluster. This is a sample figure with an arbitrary number of clusters.

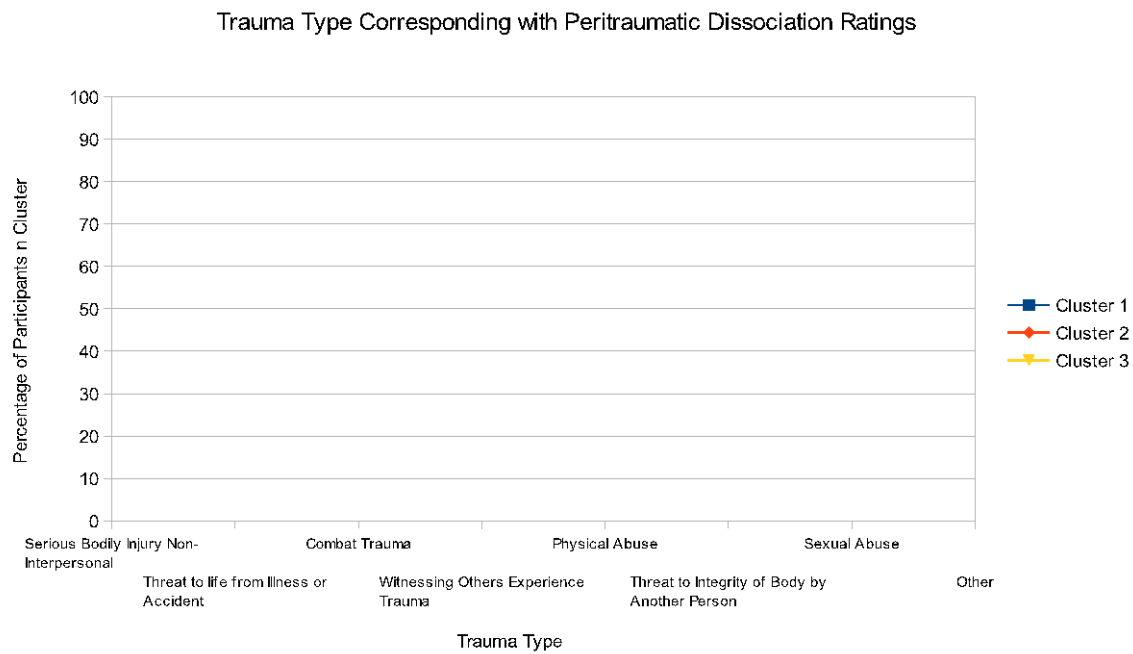


Figure 5. Criterion A trauma type associated with ratings of peritraumatic dissociation, reported as a percentage of participants in each cluster endorsing type of trauma out of total participants in the cluster. This is a sample figure with an arbitrary number of clusters.

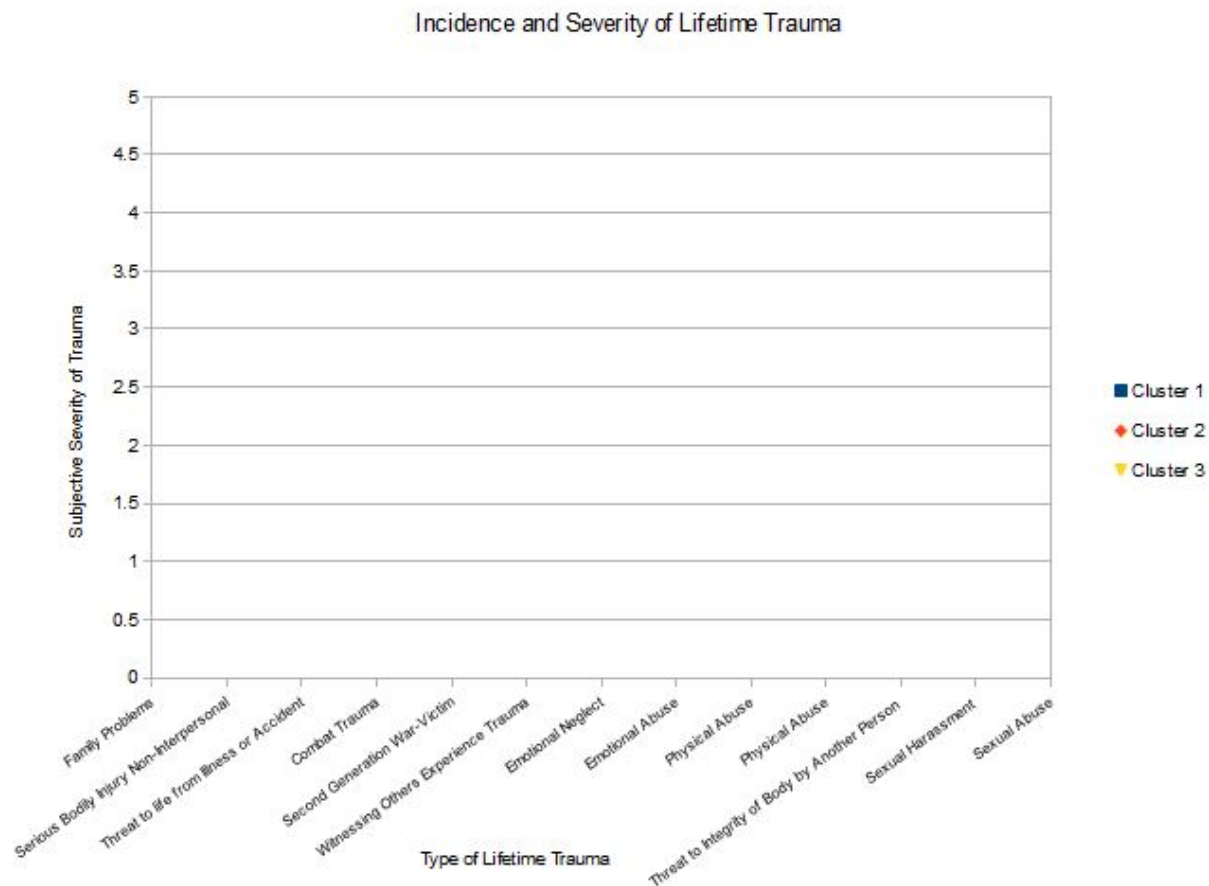


Figure 6. Incidence and subjective severity of lifetime experience of types of traumatic events, as determined by ratings on the TEC, corresponding with each cluster. This is a sample figure with an arbitrary number of clusters.

Multiple regression. Finally, multiple regression will be used to determine whether the composite variables of peritraumatic dissociation are associated with subsequently developed symptoms of PTSD. This will determine the variance in PTSD symptom severity predicted uniquely by each composite score of peritraumatic dissociation while other composite scores are statistically controlled. Simultaneous or standard regression will be used to calculate coefficients for one regression equation that includes the entire set of predictors while adjusting for confounding variables. Covariates entered into the model and held constant will include trauma-assessment interval (the length of time that has passed since the traumatic event) and

degree of total persisting dissociation as measured by the MDI. The PTSD symptom severity (PCL) will then be regressed with composite variables and variables not well represented by the factor solution in order to determine the variability in PTSD symptoms that is predicted from each grouping of peritraumatic dissociation. A simultaneous regression is preferred because it provides the most conservative assessment of the unique predictive contribution of each variable (Warner, 2013). It is also the simplest type of multiple regression to run and report, as all predictor variables are treated equally (each variable is assessed controlling for all other predictors).

Initially, data will be screened two ways for violations of statistical assumptions. A histogram of each predictor variable and the outcome variable will be examined for the shape of distribution of scores. All variables, including the outcome variables, should have approximately normal distributions, and outliers may potentially be either removed or modified. Additionally, a scatter plot for every pair of variables will be obtained and examined; ideally, the scatter plots will show a linear relation between variables, homogeneous variance (for the variable on the vertical axis) at different score values (of the variable on the horizontal axis) and no extreme bivariate outliers (Warner, 2013).

The effect size for the overall regression model with all predictors is indexed by multiple R , multiple R^2 , and adjusted multiple R^2 (Warner, 2013). The effect-size for each individual predictor variable is sr^2_{unique} , which is the estimate of the unique proportion of variance predictable from each variable (Warner, 2013). The correlations among the variables and regression results (including the squared correlation coefficient, b and β values, and the sr^2_{unique} of each predictor variable) are displayed in Table 11. If peritraumatic dissociation is related to PTSD symptomatology independent of persisting dissociation and trauma-assessment time

interval, there will be a significant portion of variability in PTSD symptom severity that is accounted for by peritraumatic dissociation composite scores.

Table 11

Predicting PTSD Severity From Peritraumatic Dissociation Composite Score in Multiple Regression Analysis

	CV 1	CV 2	CV 3	CV 4	b	β	sr^2_{unique}
CV 1							
CV 2							
CV 3							
CV 4							
Intercept							
R^2							
R^2_{adj}							
R							

Note. Table format adapted from Tabachnick and Fidell (2007, as cited by Warner, 2013). The matrix to the left in the table will be populated with correlations between composite variables. Composite variables of peritraumatic dissociation are represented by the abbreviation CV. This is a sample table with an arbitrary number of composite variables. Statistics with $p < .05$ will have *** following the statistic.

Evaluation of Results and Discussion

The results of the factor and cluster analysis will be judged by the elegance of the factor model and conceptual utility. Statistical methods of clustering variables will organize variables into factors and clusters regardless of underlying or natural groupings of peritraumatic dissociation or participant characteristics. Thus, it is critical that the researcher examine the factor and cluster solution for interpretability and conceptual utility, as well as undergo multiple methods of factoring and clustering the data.

Both overall multiple regression effect size and the predictive contribution of each individual variable will be examined to evaluate the results of the multiple regression. The F ratio indicating the significance of the overall regression will first be assessed for statistical significance. Subsequently, the t ratio for the predictive contribution of each variable will be evaluated for significance in two-tailed tests (Warner, 2013). The magnitude of effect of the

overall model, estimated by R^2 , will be compared to the multiple regression effect size index recommended for a medium expected effect size ($f^2 = 0.15$; Cohen, 1992).

If the factor and cluster analysis do not correspond to the theorized three mechanisms of dissociation (clinical dissociation, evolution-prepared dissociation, and tonic immobility), there are several possible explanations that might account for the results:

1. Clinical dissociation may be a phenomenon more likely to be experienced as a form of persisting dissociation than peritraumatic dissociation, occurring after (or independently of) evolutionary-based dissociative responses.
2. There may be a larger number of factors that cluster into multiple types of evolution-prepared reactions, including the orienting reflex, unconditioned freezing, and conditioned freezing (learned helplessness).
3. There may be a larger number of factors that cluster into multiple types of clinical peritraumatic dissociation, such as amnesia and reduced awareness of the surroundings.
4. There may be a differing configuration of factors or clusters, such as those that may represent the different peritraumatic reactions described by Bryant (2007): time distortion, reduced awareness, emotional numbing, amnesia, and derealization.
5. There may be a differing configuration of factors or clusters that divide peritraumatic reactions into types that have not yet been anticipated by the current research.

If the regression analysis reveals that the factor scores of tonic immobility and clinical dissociation do not account for variance in PTSD symptomatology as predicted, or that evolution-prepared dissociation unexpectedly accounts for variance in PTSD symptoms, then one of several explanations may be applicable. It is possible that PTSD symptoms are more

closely linked to other mechanisms of dissociation than those hypothesized. If none of the peritraumatic dissociation factors are found to contribute to the variance in PTSD symptoms, there are several potential explanations:

1. The factor analysis did not accurately capture the configuration of dissociation clusters that are most responsible for the link between peritraumatic dissociation and PTSD.
2. The link between peritraumatic dissociation and PTSD is the result of combinations of experiencing two or more domains of dissociative response during a trauma but not a single domain.
3. The link between dissociation and PTSD symptoms that is well-replicated in the literature may be more related to persisting than peritraumatic dissociation or particular combinations of clusters of peritraumatic and persisting dissociation.
4. The risk for PTSD may be heightened by unique combinations of peritraumatic distress and emotional arousal (for example, those who are both affectively aroused and emotionally stressed, rather than those that were solely emotionally aroused [while both scenarios may have elicited peritraumatic dissociation]; Waelde et al., 2009).

If the factor and cluster analysis yields certain configurations of peritraumatic dissociation, the analysis will likely support the theory of divisions of peritraumatic dissociation explicated in chapter three. These configurations include three factors of items that measure evolution-prepared dissociation, tonic immobility, and clinical dissociation, and multiple clusters of trauma survivors that cluster into the predicted categories of variables (for example, one cluster of survivors with minimal posttraumatic symptoms and experiences of evolution-prepared

dissociation; one cluster of survivors with repetitive childhood trauma with clinical peritraumatic and persisting dissociation and dissociative subtype PTSD, and so on). However, caution must be used in interpreting these cluster and factor structures to represent real or natural groupings, as data can be clustered regardless of underlying groups. Multiple analyses and other validity checks help support the usefulness and replicability of these clusters, but they are still category-imposing, rather than category-discovering. Nevertheless, the analysis is equally useful whether or not it supports the theory of peritraumatic dissociation divisions and related predictions detailed in Chapter 3. Overall, the research design seeks to illustrate different kinds of peritraumatic dissociation, regardless of whether they represent groupings hypothesized in this dissertation, in order to disambiguate the relationship between peritraumatic dissociation and subsequent development of PTSD.

Chapter 6: Summary and Discussion

This chapter summarizes the purpose and propositions in this dissertation, followed by implications and limitations of both the proposed theory of divisions of peritraumatic dissociation and the corresponding research design. Implications will address pedagogy and clinical implications, assessment and research of dissociation, and directions for future research.

Summary and Relationship Between Theory and Research Design

This dissertation describes a theory for differentiating peritraumatic experiences of dissociation, which is designed to explain the contradictory and vague research on the link between peritraumatic dissociation and subsequent development of PTSD. Three different types of peritraumatic dissociation (evolution-prepared dissociation, tonic immobility, and clinical dissociation) were explicated and distinguished on the basis of phenomenology, neurobiology, and evolutionary purpose. They further differentiated along the type of event that would evoke each system of response, predisposing factors, and risk to multiple kinds of post-traumatic sequelae. This theory was applied to a comprehensive research design that would use factor analysis, cluster analysis, and multiple regression to determine how natural factors and groupings of experiences manifest for trauma survivors rating a composite questionnaire on peritraumatic dissociation. Cluster analysis was proposed to clarify the way that individuals cluster on the basis of relevant variables, and multiple regression would elucidate the variability in PTSD symptoms explained by different factors of peritraumatic dissociation.

The mutually enhancing theory and research design portions of this dissertation are informed by the idea that empirical investigation complements theory development. Skinner (1981) argues that there is continual interplay between theory development and empirical study. Theory construction involves first describing theoretical clusters and their precise definitions,

how they are functionally linked, and the purpose of each. This is followed by internal validation by empirical study and an evaluation of its reliability. Finally, external validation is required to evaluate predictive validity, which corresponds to clinical meaningfulness of the theorized clusters and generalizability to multiple populations (Skinner, 1981). Predictive validity is required for a description of theoretical categories to be clinically useful and enhance decision making with respect to conceptualization and appropriateness of intervention for a particular person or group of persons. These components—theory formulation, internal validation, and external validation—all engage in a continuous interplay as refinements are made to the underlying theoretical model of classification. Thus, the theoretical and research design components of this dissertation are reciprocally intertwined and both necessary to fully develop the theory of divisions of peritraumatic dissociation.

Arguments posed by this dissertation require explaining implications and limitations of the theory and the research design. Implications of both the theory and research design will be combined in the next section, and limitations of both theory and research design will be discussed separately.

Implications

The ideas in this dissertation have pedagogical, clinical, and research implications. For pedagogical implications, improved understanding of peritraumatic dissociation and its link to posttrauma psychopathology will enrich the awareness and teaching of these topic areas. Foa (1995) suggests that our understanding of the complexity of post-traumatic sequelae is hampered when PTSD subjects with different symptom patterns are grouped in the same diagnostic category (as cited in Lanius, Bluhm, & Lanius, 2007). Thus, research that helps to disambiguate conceptual definitions of dissociation and the relationship of dissociation to traumatic

experiences is important to the teaching of these topics.

The ideas present in the theory and subjected to empirical scrutiny by the research design also have potentially rich clinical benefits. One is in psychoeducation for both individuals who have experienced trauma and treating clinicians. The effectiveness and direction of clinical work is often enhanced when grounded in empirical literature and research. One way in which the field of research enriches practice is by providing a categorical taxonomy and mapping to the different kinds of experiences that may otherwise be either poorly understood or have an assumed phenomenology. This taxonomy provides a way of understanding both how different kinds of peritraumatic dissociation may be experienced by survivors of trauma, and the relationships of these types of peritraumatic experiences to persisting dissociation, PTSD, and particularly dissociative subtype of PTSD. Clinicians benefit from an understanding of these relationships when it is used to inform assessment of posttrauma psychopathology and conceptualization of a client.

Further, these conceptual mappings can be used in psychoeducation of a trauma survivor. Psychoeducation is increasingly used as an intervention following trauma, and entails providing information about the impact of stress, posttraumatic symptoms, and how to manage them (Wessely, Bryant, Greenberg, Earnshaw, Sharpley, & Hughes, 2008). Given the confusing and alienating symptoms people undergo both during and after trauma, it may be helpful for survivors to understand the possible nature, origins, and evolutionary derivations of their experiences. Rather than priming people to consider their experiences as pathological symptoms (Wessely et al., 2008), psychoeducation should focus on clarifying and normalizing experiences in the context of a framework explaining how and why dissociation may have occurred or been potentially beneficial for either psychic or biological survival at the time of trauma.

Although it is difficult if not impossible for practitioners to intervene in dissociation during a traumatic event, the theory offers a framework that may be useful in intervening with subsequent dissociative symptomatology that originates from the same hypnotic phenomena of clinical dissociation. Given the nature of some kinds of persisting dissociation and its arguable mechanistic overlap with absorptive detachment, these dissociative episodes entail grounding in present sensory experience, which is the antithesis of dissociative absorption (Allen & Coyne, 1995).

Another clinical implication of this theory is providing clarification of when cognitive-behavioral therapy techniques such as exposure can be useful or harmful, and how to negotiate challenges that arise with these techniques. Dissociative responding such as detachment and depersonalization during traumatic processing can significantly disrupt the habituation that is suggested to be the crucial element of change in exposure-based therapies (McFarlane, 2013). Exposure may also be less effective because dissociation confuses the connection between stimulus and response, causing delayed hyperarousal well after the stimulus (Ginzburg et al., 2006). When persisting dissociation operates as an automatic and reflexive response to distress, exposure-based treatments may not be useful and may even be harmful if it further establishes dissociation as a habitual response to stress. Marx et al. (2008) suggests avoiding treatments such as exposure and relaxation for clients who respond to trauma with reduced physiological arousal and motor inhibition (such as those responding to cues with tonic immobility). Instead, they advocate focusing initially on increasing arousal to traumatic cues. It is essential to first focus on managing dissociative symptoms prior to engaging in exposure-based treatments that are designed to increase physiological arousal.

This topic of study also carries implications for how peritraumatic dissociation and

posttraumatic responses should be assessed and studied. In the assessment of dissociation, it is crucial to avoid collecting all distortions of perception and experience and subsuming them under one broad cluster. This has significantly hampered our understanding of dissociative responding and its relationship with PTSD, and reflects a vague definition of dissociation itself. Instead, specificity needs to be used when assessing and researching dissociative symptomatology. Phylogenetically early and “primitive” alterations of consciousness need to be distinguished from legitimate clinical dissociation symptoms. Further, neurobiological mechanisms underpinning hypoaroused (dissociative and detached) and hyperaroused responding to trauma are likely different in these distinct reactions. Thus, the heterogeneity of neurobiological and phenomenological responses to trauma cues need to be addressed in research designs (and particularly physiological or functional imaging studies; Lanius, Bluhm, & Lanius, 2007).

Limitations of Theory

The theory of divisions of peritraumatic dissociation is first limited by its current lack of empirical support. Although aspects of the theorized clusters are informed by current research, the three divided groupings as they are outlined are not currently supported by existing research. Thus, empirical investigation may refute the idea of these three distinct systems of dissociative responding, and an alternative mapping of peritraumatic dissociation may emerge. The research design that accompanies the theory presented in this dissertation is meant to correct for this limitation, and to elucidate clusters of peritraumatic dissociation with empirical evidence, regardless of whether research supports or refutes the theory.

Another limitation of this theory is the ambiguity between clinical peritraumatic and persisting dissociation reactions, both in measurement and differentiation in their relationships

with peritraumatic and posttraumatic symptoms. Clinical dissociation, which causes sensory distance from the environment, can become increasingly automatic in response to ongoing stressors. This makes peritraumatic and persisting dissociation difficult to distinguish, and it is possible that clinical dissociation that occurs during a trauma may actually be a manifestation of persisting clinical dissociation that has become an entrenched system of response, rather than a novel peritraumatic dissociative experience. This is particularly the case because persisting dissociation often becomes progressively ingrained and habitual when there has been repetitive (particularly childhood) trauma, thus making obscure the distinction between peritraumatic dissociation and persisting dissociation (with repeated traumatic events characterizing the subsequent stressors responded to with dissociation in the case of persisting dissociation). Hence, it is not clear whether clinical dissociation can actually occur peritraumatically, or whether all clinical dissociation develops as a mode of response after certain kinds of traumatic experiences. The cluster analysis embedded in the proposed research design may help to address this question, but it is also possible that additional research may have to further disambiguate the nature of clinical dissociation.

Another limitation of this theory is the absence of inclusion of structural dissociation as a possible distinguishing feature in types of peritraumatic dissociation. Because the relationship of structural dissociation with peritraumatic and persisting dissociation is not fully addressed in the present research design, investigating this is a worthwhile direction for future research. Severe drops of consciousness can be associated both with structural dissociation and with dissociative absorption, detachment, and hypnotic phenomena independent of structural dissociation (Steele et al., 2009). It is difficult to distinguish between these mechanisms of dissociation in research designs, but one possible way that structural dissociation can be differentiated from other

alterations of consciousness is by inquiring about the experience of the self in the context of dissociative responding. Structural dissociation is associated with subjective feelings of fragmentation of the self, with multiple and incompatible experiences of self across time and experiences, while other alterations of consciousness that are not structural in nature emerge from a basically coherent experience of self. Differentiating this mechanism in the study of peritraumatic and posttraumatic dissociation would enhance our comprehension of mechanisms and conceptual definitions of dissociation, as well as the multifaceted relationship between peritraumatic dissociation and posttraumatic sequelae.

Limitations of Research Design

The limitations of the research design fall into two categories: limitations of the methodology of cluster or factor analysis or measurement, and general limitations to the enactment and feasibility of the research design.

Limitations of methodology. The primary limitation to cluster analysis methodology is built into the basic assumptions of cluster analysis—that cluster paradigms are factor imposing rather than factor discovering. It is often assumed that these clustering algorithms will reveal natural groupings inherent in the data, whereas clustering is actually used to impose a map of groupings on existing structure. This is not a significant limitation as long as this basic feature of cluster analysis is kept in mind and sufficient investigations of cluster validity are used to support the replicability and validity of the cluster structure. Cluster solutions should be regarded as exploratory descriptions of the structure of the data, rather than confirmations of theoretical structure (Aldenderfer & Blashfield, 1984).

There are also some features of the participant makeup that pose challenges for the factor analysis. Cluster analysis values heterogeneity in the participants. When a participant body has

many distinguishing variables, these variables are useful in determining cluster structure. It is assumed that there are distinct groupings of different kinds of participants when a methodology like cluster analysis is used, and these groupings will differ on a multitude of variables. In contrast, homogeneity in participants is emphasized in factor analysis in order to achieve accurate correlations in the items submitted for factor analysis. Whenever diverse types of respondents are expected to respond differently to the variables, factor analysis becomes compromised because the resulting correlation solution will not be a good representation of the unique structures of each group (Sheppard, 1996). To accommodate for this, it may be appropriate to perform separate factor analyses on each subgroup of people. Subgroups will have to be differentiated via cluster analysis prior to the specific investigation of different factor analyses per subgroup of trauma survivor. For the purpose of prioritizing simplicity and feasibility, this particular direction was not proposed in this research design, but may be a fruitful direction in future research.

Several specific methodological and measurement limitations exist in the proposed research design. The limitations to using composite variables and original items in the cluster analysis has been reviewed in Chapter 3, but it was determined that despite the limitations, using composite variables is likely to be more appropriate than the full set of original items. Additionally, using multiple questionnaires in an aggregate measure poses potential problems with variances and psychometric properties of the measure. Given that the questionnaires have different variances, combining them into one larger measure may complicate the statistical properties of the measure that is being submitted to factor analysis. Often, standardization is useful in preprocessing prior to cluster analysis. However, given that the methodology calls for combining all the items together, it does not make sense to distinguish the scores on each

questionnaire and divide by the variances in each measure. Each measure should not be considered separately because they each capture certain aspects of the underlying clusters, reflecting different phenomenology and biologically causal mechanism, hence the combination of each measure into one aggregate measure. Another issue is that the scale of many of the measures had to be altered in order to make the scales equivalent across the composite measure. It is always possible that this slight alteration of each measure's scale may change the psychometric properties of the questionnaires. Despite this possibility, changing some of the measures' scales was necessary to develop the aggregate measure.

There are also difficulties in the way that particular variables are measured that can be considered to be potential limitations of the study design. One issue that arose when distinguishing and measuring dissociative PTSD is that even though this subtype has been observed in research for a length of time, it is a relatively new diagnosis in the DSM-V. Further, previous research that distinguishes this subtype of responding has primarily emerged from psychophysiological or brain imaging studies, which would not be feasible in this particular study. Given that dissociative subtype of PTSD is a very recent diagnosis at the time of this writing, no measures with established psychometric properties have been created to measure the presence or severity of dissociative PTSD (Dell, 2009b). Further, Dell (2009b) suggests that there may be several kinds of dissociative PTSD. He proposes three types: (a) PTSD with dissociative flashbacks (flashbacks that completely overtake present sensory and temporal experience), (b) dissociative PTSD that involves an overuse of evolution-prepared dissociation (such as the subtype described by Frewen and Lanius (2006) in their series of brain imaging studies), and (c) dissociative PTSD that entails defensive compartmentalization of trauma. The present study only measures dissociative PTSD that Dell describes as involving an overuse of

evolution-prepared dissociation. Given that the phenomenology and physiology of dissociative PTSD that has been described by brain imaging studies seems to correspond highly with descriptions of detachment, inhibition of arousal, and depersonalization, a short depersonalization measure was used as an approximate tool of measurement. This is based on the assumption that dissociative PTSD is potentially present when PTSD symptoms occur in conjunction with more severe depersonalization symptoms. However, more sophisticated ways of measuring dissociative PTSD exist (i.e., brain imaging and physiological studies). Further, the way that dissociative PTSD is measured in this study may also be only measuring one particular manifestation of dissociative PTSD, as described by Dell (2009b).

Another complication in variable measurement is the difficulty in distinguishing persisting dissociation that occurs after a trauma from a generalized dissociation tendency that was present before the trauma. Other studies have differentiated these variables via a longitudinal or prospective design (e.g., see Murray, Ehlers, & Mayou, 2002). However, a retrospective design in this study was determined to be the only feasible method of measuring the variables that were essential to address the research questions, particularly because many participants may identify childhood traumatic experiences as the events that were most significant or distressing to them. Thus, the difficulty in distinguishing persisting dissociation from generalized dissociation remains as a limitation of the study.

Feasibility limitations. Aside from the stated limitations of the methodology, there are two primary and overarching limitations to enacting the study. These are the difficulty of attaining the required number of participants, and the potential burden to participants posed by large number of items necessary in the design.

Recruiting the required 200 participants poses a considerable challenge. This dissertation

was originally meant to enact the quantitative study in a Veterans Affairs Medical Center (VAMC), but it was determined to be not feasible given the resources and time allotted to this author, and consequently pursued into a research design. Further, the cluster analysis embedded in the research design will yield the most valid cluster structure if participants are a heterogeneous sample that has experienced a variety of types of traumatic experiences, ages at which trauma occurred, and posttraumatic sequelae (such as PTSD and persisting dissociation severity). Although it is possible to recruit participants with heterogeneous experiences from one setting, the setting must be able to provide access to participants with varying characteristics. Otherwise, multiple settings may be required to achieve desired heterogeneity in the participant makeup. To make the study more feasible, the researcher might consider establishing connections with other prominent researchers or clinicians who could facilitate a relationship between the person executing the study and the organization(s) or setting(s) at which participants will be recruited.

Additionally, the burden of time and effort required of participants will be significant in this study design. The entire study requires the rating or answering of 132 items total (38 items in the aggregate peritraumatic dissociation measure; 30 items in the MDI; 10 items in the DDQ; 17 items in the PCL; and 37 items in the TEC, which includes basic demographic information). Further, many of the items ask details about significantly personal and/or distressing experiences, and answering them is likely to be emotionally demanding and possibly stressful. This is an appreciable demand on participants' time and distress tolerance. This considerable time demand in conjunction with the high number of participants necessary to enact the study design is likely to pose a potentially serious barrier to feasibility. Although a way to reduce demand might be to discard one or more of these measures, each of the instruments were chosen carefully as a means

to measure the required variables necessary to answer the research questions. There are no redundant items or measures, and the instruments chosen for inclusion were considered to be sufficiently important to outweigh the serious cost of high demand on participants. Carrying forward this research should allow for a substantial amount of time to complete the study, and as previously stated, exert effort to form relationships with existing researchers that may be able to facilitate access to resources and participant populations that are able and willing to be recruited for the study.

Conclusion

The theory and research design proposed in this dissertation are grounded in a need to significantly reconsider the way that dissociation is defined and studied in the context of trauma. A great deal of research has been conducted by assessing all alterations of consciousness, even those that are diametrically opposed to one another (such as enhanced mental clarity versus fuzziness and dampening of sensory modalities), and grouping them under one overarching category of dissociation. This method of measurement is not grounded in a sufficiently specific description of the construct of dissociation, and has produced contradictory and misleading research on the relationship between peritraumatic dissociation and posttraumatic sequelae. This entire area of study, including existing definitions and measurements, needs to be reevaluated and clarified. This necessitates considering the nature of the peritraumatic reaction and its underlying defensive role. The argument posed in this dissertation regards distinct kinds of peritraumatic dissociation to reflect differences in phylogenetic origins of the response, neurobiological underpinnings, and purpose of either physical survival or psychic alleviation of pain. It is crucial to thoroughly consider our existing understanding of what constitutes peritraumatic dissociation and how this typically manifests for trauma survivors. Careful

research that is grounded in a solid theoretical concept of dissociation will facilitate a clearer understanding of the complexity of peritraumatic and posttraumatic response. The theory and research design described in this dissertation are intended to promote the rigorousness and thoughtfulness of future research on peritraumatic dissociation.

References

- Abrams, M. P., Hons, B. A., Carleton, N., Taylor, S., & Asmundson, G. J. G. (2009). Human tonic immobility: Measurement and correlates. *Depression and Anxiety, 26*, 550–556.
- Adams, J. A. (1988). *Dangling from the Golden Gate Bridge and other narrow escapes*. New York, NY: Ballantine Books.
- Aldenderfer, M. S., & Blashfield, R. K. (1984). *Cluster analysis*. Newbury Park, CA: SAGE Publications, Inc.
- Allen, J. G., Console, D. A., & Lewis, L. (1999). Dissociative detachment and memory impairment: Reversible amnesia or encoding failure?. *Comprehensive Psychiatry, 40*(2), 160–171.
- Allen, J. G., & Coyne, L. (1995). Dissociation and vulnerability to psychotic experience: The Dissociative Experiences Scale and the MMPI-2. *The Journal of Nervous and Mental Disease, 183*(1), 615–622.
- Allen, J. G., Coyne, L., & Console, D. A. (1997). Dissociative detachment relates to psychotic symptoms and personality decompensation. *Comprehensive Psychiatry, 38*(6), 327–334.
- Allen, J. G., Fultz, J., Huntoon, J., & Brethour, J. R. (2002). Pathological dissociative taxon membership, absorption, and reported childhood trauma in women with trauma-related disorders. *Journal of Trauma and Dissociation, 3*(1), 89–110.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.
- Bados, A., Toribio, L., & García-Grau, E. (2008). Traumatic events and tonic immobility. *The Spanish Journal of Psychology, 11*(2), 516–521.
- Bailey, C. L. (2006). *In the shadow of the cross*. Lincoln, NE: iUniverse, Inc.

- Barton, N., & Partridge, L. (2000). Limits to natural selection. *BioEssays*, 22(12), 1075–1084.
- Beere, D. B. (2009). Dissociative perceptual reactions: The perceptual theory of dissociation. In P. F. Dell & J. A. O’Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. 209–223). New York, NY: Routledge.
- Blakemore, S., & Frith, C. (2003). Self-awareness and action. *Current Opinion in Neurobiology*, 13, 219–224. doi:10.1016/S0959-4388(03)00043-6
- Blakemore, S., Wolpert, D., & Frith, C. (2000). Why can’t you tickle yourself?. *Neuroreport*, 11(11), R11–R16.
- Blashfield, R. K. (1980). Propositions regarding the use of cluster analysis in clinical research. *Journal of Consulting and Clinical Psychology*, 48, 456–459.
- Bliss, E. L. (1984). Spontaneous self-hypnosis in multiple personality disorder. *Psychiatric Clinics of North America*, 7(1), 135–148.
- Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, 59(1), 20–28.
- Bonanno, G. A., & Mancini, A. D. (2012). Beyond resilience and PTSD: The heterogeneity of responses to potential trauma. *Psychological Trauma: Theory, Research, Practice, and Policy*, 4(1), 74–83.
- Borgen, F. H., & Barnett, D. C. (1987). Applying cluster analysis in counseling psychology research. *Journal of Counseling Psychology*, 34(4), 456–468.
- Bozorgmehr, J. E. H. (2012). Natural selection as a paradigm of opportunism in biology. *Journal of Bioeconomics*, 14, 61–75. doi:10.1007/s10818-010-9094-5
- Butler, L. D., Duran, R. E. F., Jasiukaitis, P., Koopman, C., & Spiegel, D. (1996). Hypnotizability and traumatic experience: A diathesis-stress model of dissociative symptomatology. *The*

- American Journal of Psychiatry*, 153(7), 42–63.
- Breh, D. C., & Seidler, G. H. (2007). Is peritraumatic dissociation a risk factor for PTSD? *Journal of Trauma & Dissociation*, 8, 53–69.
- Bremner, J. D., & Brett, E. (1997). Trauma-related dissociative states and long-term psychopathology in posttraumatic stress disorder. *Journal of Trauma Stress*, 10(1), 37–49.
- Bremner, J. D., Krystal, J. H., Putnam, F. W., Southwick, S. M., Marmar, C., Charney, D. S., & Mazure, C. M. (1998). Measurement of dissociative states with the Clinician-Administered Dissociative States Scale (CADSS). *Journal of Traumatic Stress*, 11(1), 125–136.
- Bremner, J. D., & Vermetten, E. (2007). Psychiatric approaches to dissociation. In E. Vermetten, M. Dorahy & D. Spiegel (Eds.), *Traumatic dissociation: Neurobiology and treatment* (pp. 239–258).
- Briere, J. Scott, C., & Weathers, F. (2005). Peritraumatic and persistent dissociation in the presumed etiology of PTSD. *American Journal of Psychiatry*, 162, 2295–2301.
- Brown, R. J. (2006). Different types of “dissociation” have different psychological mechanisms. *Journal of Trauma & Dissociation*, 7(4), 7–28.
- Browne, M. W. (2001). An overview of analytic rotation in exploratory factor analysis. *Multivariate Behavioral Research*, 36(1), 111–150.
- Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, 21(2), 230–258.
- Browne, M. W., Cudeck, R., Tateneni, K., & Mels, G. (1998). CEFA: Comprehensive Exploratory Factor Analysis [Computer software]. Retrieved from <http://quantrm2.psy.ohio-state.edu/browne/>

- Brunet, A., Weiss, D. S., Metzler, T. J., Best, S. R., Neylan, T. C., Rogers, C., Fagan, J., & Marmar, C. R. (2001). The peritraumatic distress inventory: A proposed measure of PTSD criterion A2. *American Journal of Psychiatry*, 158, 1480–1485.
- Bryant, R. A. (2007). Does dissociation further our understanding of PTSD? *Journal of Anxiety Disorders*, 21, 183–191.
- Bryant, R. A. (2009). Is peritraumatic dissociation always pathological?. In P. F. Dell & J. A. O’Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. 185–196). New York, NY: Routledge.
- Bryant, R. A., Brooks, R., Silove, D., Creamer, M., O’Donnell, M., & McFarlane, A. C. (2011). Peritraumatic dissociation mediates the relationship between acute panic and chronic posttraumatic stress disorder. *Behaviour Research and Therapy*, 49, 346–351.
doi:10.1016/j.brat.2011.03.003
- Bryant, R. A., & Panasetis, P. (2005). The role of panic in acute dissociative responses following trauma. *British Journal of Clinical Psychology*, 44, 489–494.
- Burgess, A. W., & Holmstrom, L. L. (1976). Coping behavior of the rape victim. *American Journal of Psychiatry*, 133(4), 413–418.
- Candel, I., & Merckelbach, H. (2004). Peritraumatic dissociation as a predictor of post-traumatic stress disorder: A critical review. *Comprehensive Psychiatry*, 45(1), 44–50.
- Cardeña, E., & Carlson, E. (2011). Acute Stress Disorder revisited. *Annual Review of Clinical Psychology*, 7, 245–267.
- Carleton, R. N., Abrams, M. P., & Asmundson, G. J. G. (2010). The Attentional Resource Allocation Scale (ARAS): Psychometric properties of a composite measure for dissociation and absorption. *Depression and Anxiety*, 27, 775–786. doi:10.1002/da.20656

- Chu, J. A., & Dill, D. L. (1990). Dissociative symptoms in relation to childhood physical and sexual abuse. *The American Journal of Psychiatry*, 147, 7, 887–892.
- Classen, C., & Koopman, C. (1993). Trauma and dissociation. *Bulletin of the Menninger Clinic*, 57(2), 178–194.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155—159.
- Cole, P. M., Alexander, P. C., & Anderson, C. L. (1996). Dissociation in typical and atypical development. In L. K. Michelson & W. J. Ray (Eds.), *Handbook of dissociation: Theoretical, empirical, and clinical perspectives* (pp. 69–89). New York, NY: Plenum Press.
- Dalenberg, C. J., & Paulson, K. (2009). The case for the study of “normal” dissociation processes. In P. F. Dell & J. A. O’Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. 145–154). New York, NY: Routledge.
- Daprati, E., Franck, N., Georgieff, N., Proust, J., Pacherie, E., Dalery, J., & Jeannerod, M. (1997). Looking for the agent: An investigation into consciousness of action and self-consciousness in schizophrenic patients. *Cognition*, 65, 71–86.
- Dell, P. F. (2009a). The phenomena of pathological dissociation. In P. F. Dell & J. A. O’Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. 225–238). New York, NY: Routledge.
- Dell, P. F. (2009b). Understanding dissociation. In P. F. Dell & J. A. O’Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. 709–856). New York, NY: Routledge.
- Dell, P. F. (2010). Involuntariness in hypnotic responding and dissociative symptoms. *Journal of Trauma and Dissociation*, 11(1), 1–18.

- Dell, P. F., & Lawson, D. (2009). An empirical delineation of the domain of pathological dissociation. In P. F. Dell & J. A. O'Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. 667–692). New York, NY: Routledge.
- Dell, P. F., & O'Neil, J. A. (2009). Preface. In P. F. Dell & J. A. O'Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. xix–xxi). New York, NY: Routledge.
- Depaulis, A., Keay, K. A., & Bandler, R. (1994). Quiescence and hyporeactivity evoked by activation of cell bodies in the ventrolateral midbrain periaqueductal gray of the rat. *Experimental Brain Research*, 99, 75–83.
- dissociationstation (2010a, September 18). Re: The evolutionary link between trauma and dissociation [Web log comment]. Retrieved from <http://understandingdissociation.com/2010/09/17/the-evolutionary-link-between-trauma-and-dissociation/>
- dissociationstation (2010b, September 19). Re: The evolutionary link between trauma and dissociation [Web log comment]. Retrieved from <http://understandingdissociation.com/2010/09/17/the-evolutionary-link-between-trauma-and-dissociation/>
- dissociationstation (2010c, November 3). Re: Disentangling animal defenses from dissociation: Part II [Web log comment]. Retrieved from <http://understandingdissociation.com/2010/10/26/disentangling-animal-defenses-from-dissociation-part-ii/>
- Dixon, J. C. (1963). Depersonalization phenomena in a sample population of college students. *The British Journal of Psychiatry*, 109, 371–375.
- Dolnicar, S., & Grun, B. (2008). Challenging “factor cluster segmentation.” *Journal of Travel*

- Research*, 47(1), 63–71.
- Donahoe, J. W. (2012). Reflections on behavior analysis and evolutionary biology: A selective review of evolution since Darwin—the first 150 years. Edited by M. A. Bell, D. J. Futuyama, W. F. Eanes, & J. S. Levinton. *Journal of the Experimental Analysis of Behavior*, 97(2), 249–260. doi:10.1901/jeab.2012.97-249
- Dorahy, M. J., & Van der Hart, O. (2007). Relationship between trauma and dissociation: A historical analysis. In E. Vermetten, M. J. Dorahy, D. Spiegel (Eds.), *Traumatic dissociation: Neurobiology and treatment* (pp. 3–30). Arlington, VA: American Psychiatric Publishing, Inc.
- Elklit, A., & Brink, O. (2004). Acute Stress Disorder as a predictor of Post-Traumatic Stress Disorder in physical assault victims. *Journal of Interpersonal Violence*, 19(6), 709–726.
- Engel, G. L. (1978). Psychologic stress, vasodepressor (vasovagal) syncope, and sudden death. *Annals of Internal Medicine*, 89, 403–412.
- Everitt, B. S. (1979). Unresolved problems in cluster analysis. *Biometrics*, 35, 169–181.
- Everitt, B. S., Landau, S., Leese, M., & Stahl, D. (2011) *Cluster analysis* (5th ed.). West Sussex, UK: John Wiley & Sons, Ltd.
- Fabrigar, L. R., & Wegener, D. T. (2012). Exploratory factor analysis. New York, NY: Oxford University Press.
- Fanselow, M. S. (1994). Neural organization of the defensive behavior system responsible for fear. *Psychonomic Bulletin & Review*, 1(4), 429–438.
- Farrer, C., Frey, S. H., Van Horn, J. D., Tunik, E., Turk, D., Inati, S., & Grafton, S. T. (2008). The angular gyrus computes action awareness representations. *Cerebral Cortex*, 18, 254–261. doi:10.1093/cercor/bhm050

- Farrer, C., & Frith, C. D. (2002). Experiencing oneself vs. another person as being the cause of an action: The neural correlates of the experience of agency. *NeuroImage*, 15, 596–603.
doi:10.1006/nimg.2001.1009
- Faymonville, M., Boly, M., & Laureys, S. (2006). Functional neuroanatomy of the hypnotic state. *Journal of Physiology Paris*, 99, 463–469.
- Fiedler, J. (1993). *Market figmentation: Clustering on factor scores versus individual variables*. Paper presented at the AMA Advanced Research Techniques Forum.
- Fikretoglu, D., Brunet, A., Best, S., Metzler, T., Delucci, K., Weiss, D. S....Marmar, C. (2006). The relationship between peritraumatic distress and peritraumatic dissociation. *The Journal of Nervous and Mental Disease*, 194(11), 853–858.
- Francisco, P. W. (1999). *Telling*. New York, NY: Cliff Street Books.
- Frankel, F. H. (1990). Hypnotizability and dissociation. *The American Journal of Psychiatry*, 147(7), 823–829.
- Frewen, P. A., & Lanius, R. A. (2006). Neurobiology of dissociation: Unity and disunity in mind-body-brain. *Psychiatric Clinics of North America*, 29(113–128).
doi:10.1016/j.psc.2005.10.016
- Freyd, J. J. (1996). *Betrayal trauma*. Cambridge, MA: Harvard University Press.
- Frischholz, E. J. (1985). The relationship among dissociation, hypnosis, and child abuse in the development of multiple personality disorder. In R. P. Kluft (Ed.), *Childhood antecedents of multiple personality* (pp. 100–126). Washington, DC: American Psychiatric Press.
- Frochot, I., & Morrison, A. M. (2000). Benefit segmentation: A review of its applications to travel and tourism research. *Journal of Travel & Tourism Marketing*, 9(4), 21–45.
- Fusé, T., Forsyth, J. P., Marx, B. P., Gallup, G. G., & Weaver, S. (2007). Factor structure of the

- Tonic Immobility Scale in female survivors of sexual assault: An exploratory and confirmatory factor analysis. *Journal of Anxiety Disorders*, 21, 265–283.
- Gallagher, S. (2000). Philosophical conceptions of the self: Implications for cognitive science. *Trends in Cognitive Sciences*, 4(1), 14–21.
- Galliano, G., Noble, I. M., Travis, L. A., & Puechl, C. (1993). Victim reactions during rape/sexual assault: A preliminary study of the immobility response and its correlates. *Journal of Interpersonal Violence*, 8, 109–114.
- Gallup, G. G., Boren, J. L., Suarez, S. D., Wallnau, L. B., & Gagliardi, G. J. (1980). Evidence for the integrity of central processing during tonic immobility. *Physiology and Behavior*, 25(189–194).
- Gallup, G. G., & Rager, D. R. (1996). Tonic immobility as a model of extreme states of behavioral inhibition. In P. Sanberg, K. Ossenkopp, & M. Kavaliers, *Motor activity and movement disorders: Research issues and applications* (pp. 57–80). Totowa, NJ: Humana Press Inc.
- Ganesan, V., Hunter, M. D., & Spence, S. A. (2005). Schneiderian first-rank symptoms and right parietal hyperactivation: A replication using fMRI. *American Journal of Psychiatry*, 162(8), 1545.
- Gelinas, D. J. (1983). The persisting negative effects of incest. *Psychiatry*, 46, 312–332.
- Ginzburg, K., Koopman, C., Butler, L. D., Palesh, O., Kraemer, H. C., Classen, C. C., & Spiegel, D. (2006). Evidence for a dissociative subtype of post-traumatic stress disorder among help-seeking childhood sexual abuse survivors. *Journal of Trauma and Dissociation*, 7(2), 7–27.
- Gladwell, M. (2005). *Blink*. New York, NY: Back Bay Books.

- Griffin, M. G., Resick, P. A., & Mechanic, M. B. (1997). Objective assessment of peritraumatic dissociation: Psychophysiological indicators. *American Journal of Psychiatry*, 154(8), 1081–1088.
- Halligan, S. L., Michael, T., Clark, D. M., & Ehlers, A. (2003). Posttraumatic stress disorder following assault: The role of cognitive processing, trauma memory, and appraisals. *Journal of Consulting and Clinical Psychology*, 71(3), 419–431. doi:10.1037/0022-006X.71.3.419
- Hariri, D., Bakermans-Kranenburg, M. J., & Van Ijzendoorn, M. J. Attachment, disorganization, and dissociation. In E. Vermetten, M. J. Dorahy, D. Spiegel (Eds.), *Traumatic dissociation: Neurobiology and treatment* (pp. 31–54). Arlington, VA: American Psychiatric Publishing, Inc.
- Heidt, J. M., Marx, B. P., & Forsyth, J. P. (2005). Tonic immobility and childhood sexual abuse: Evaluating the sequela of rape-induced paralysis. *Behavior Research and Therapy*, 43, 1157–1171.
- Henry, D. B., Tolan, P. H., & Gorman-Smith, D. (2005). Cluster analysis in family psychology research. *Journal of Family Psychology*, 19(1), 121–132. doi:10.1037/0893-3200.19.1.121
- Hesse, E., & Van Ijzendoorn, M. H. (1999). Propensities toward absorption are related to lapses in the monitoring of reasoning or discourse during the Adult Attachment Interview: A preliminary investigation. *Attachment & Human Development*, 1(1), 67–91.
- Hetzel, M. D., & McCanne, T. R. (2005). The roles of peritraumatic dissociation, child physical abuse, and child sexual abuse in the development of posttraumatic stress disorder and adult victimization. *Child Abuse & Neglect*, 29, 915–930.

doi:10.1016/j.chiabu.2004.11.008

Holly Gray. (2010, September 17). Re: The evolutionary link between trauma and dissociation

[Web log comment]. Retrieved from

<http://understandingdissociation.com/2010/09/17/the-evolutionary-link-between-trauma-and-dissociation/>

Holmes, E. A., Brown, R. J., Mansell, W., Fearon, P., Hunter, E. C. M., Franquillo, F., & Oakley,

D. A. (2005). Are there two qualitatively distinct forms of dissociation? A review and some clinical implications. *Clinical Psychology Review, 25*, 1–23.

Horton, J. E., Crawford, H. J., Harrington, G., & Downs, J. H. (2004). Increased anterior corpus callosum size associated positively with hypnotizability and the ability to control pain.

Brain, 127, 1741–1747. doi:10.1093/brain/awh196

Howell, E. F. (2005). *The dissociative mind*. New York, NY: Routledge.

Huopainen, H. (2002). Freud's view of hysteria in light of modern trauma research. *The*

Scandinavian Psychoanalytic Review, 25, 92–107.

Johnson, D. M., Pike, J. L., & Chard, K. M. (2001). Factors predicting PTSD, depression, and dissociative severity in female treatment-seeking childhood sexual abuse survivors. *Child Abuse & Neglect, 25*, 129–198.

Keen, S. M., Kutter, C. J., Niles, B. L., & Krinsley. (2008). Psychometric properties of PTSD Checklist in sample of male veterans. *Journal of Rehabilitation Research & Development, 45*, 465–474.

King, L. A., King, D. W., Keane, T. M., Fairbank, J. A., & Adams, G. A. (1998).

Resilience-recovery factors in Post-Traumatic Stress Disorder among female and male Vietnam veterans: Hardiness, postwar social support, and additional stressful life events.

- Journal of Personality and Social Psychology*, 74(2), 420–434.
- Lanius, R. A., Bluhm, R., & Lanius, U. Posttraumatic stress disorder symptom provocation and neuroimaging. In E. Vermetten, M. J. Dorahy, D. Spiegel (Eds.), *Traumatic dissociation: Neurobiology and treatment* (pp. 191–218). Arlington, VA: American Psychiatric Publishing, Inc.
- Lanius, R. A., Vermetten, E., Loewenstein, R. J., Brand, B., Schmahl, C., Bremner, J. D., & Spiegel, D. (2010). Emotion modulation in PTSD: Clinical and neurobiological evidence for a dissociative subtype. *The American Journal of Psychiatry*, 167(6), 640–647.
- Lensvelt-Mulders, G., van der Hart, O., van Ochten, J., van Son, M. J. M., Steele, K., & Breeman, L. (2008). Relations among peritraumatic dissociation and posttraumatic stress: A meta-analysis. *Clinical Psychology Review*, 28, 1138–1151.
doi:10.1016/j.cpr.2008.03.006
- Lima, A. A., Fiszman, A., Marques-Portella, C., Mendlowicz, M. V., Coutinho, E. S. F., Maia, D. C. B. ... Figueira, I. (2010). The impact of tonic immobility reaction on the prognosis of posttraumatic stress disorder. *Journal of Psychiatric Research*, 44, 224–228.
- Marmar, C. R., Weiss, D. S., & Metzler, T. J. (2004). The peritraumatic dissociative experiences questionnaire. In J. P. Wilson & T. M. Keane (Eds.), *Assessing psychological trauma and PTSD* (pp. 144–167). New York, NY: Guilford Press.
- Marmar, C. R., Weiss, D. S., Schlenger, W. E., Fairbank, J. A., Jordan, K., Kulka, R. A., & Hough, R. L. (1994). Peritraumatic dissociation and posttraumatic stress in male Vietnam theater veterans. *American Journal of Psychiatry*, 151, 902–907.
- Marshall, G. N., & Schell, T. L. (2002). Reappraising the link between peritraumatic dissociation

- and PTSD symptom severity: Evidence from a longitudinal study of community violence survivors. *Journal of Abnormal Psychology*, 111(4), 626–636.
- Marx, B. P., Forsyth, J. P., Gallup, G. G., Fusé, T., & Lexington, J. M. (2008). Tonic immobility as an evolved predator defense: Implications for sexual assault survivors. *Clinical Psychology: Science and Practice*, 15, 74–90.
- McFarlane, A. C. (2000). Posttraumatic stress disorder: A model of the longitudinal course and the role of risk factors. *The Journal of Clinical Psychiatry*, 61(5), 15–23.
- McFarlane, A. C. (2013). Biology not culture explains dissociation in posttraumatic stress disorder. *Biological Psychiatry*, 73, 296–297. doi:10.1016/j.biopsych.2012.11.026
- McNally, R. J. (2003). Psychological mechanisms in acute response to trauma. *Biological Psychiatry*, 53, 779–788. doi:10.1016/S0006-3223(02)01663-3
- Milligan, G. W., & Hirtle, S. C. (2004). Clustering and classification methods. In J. A. Schinka, W. F. Velicer, & I. B. Weiner (Eds.), *Handbook of psychology: Vol. 2. Research methods in psychology* (1st ed.) (pp. 165–186). Hoboken, NJ: John Wiley & Sons, Inc.
- Morgan, A. H., & Hilgard, E. R. (1973). Age differences in susceptibility to hypnosis. *The International Journal of Clinical and Experimental Hypnosis*, XXI(2), 78–83.
- Morgan III, C. A., Southwick, S. M., Hazlett, G., & Steffian, G. (2007). Symptoms of dissociation in healthy military populations. In E. Vermetten, M. J. Dorahy, & D. Spiegel (Eds.), *Traumatic dissociation: Neurobiology and treatment* (pp. 157–180). Arlington, VA: American Psychiatric Publishing, Inc.
- Murray, J., Ehlers, A., & Mayou, R. A. (2002). Dissociation and post-traumatic stress disorder: Two prospective studies of road traffic accident survivors. *The British Journal of Psychiatry*, 180, 363–368.

- Nash, M. R., & Lynn, S. J. (1985–86). Child abuse and hypnotic ability. *Imagination, Cognition and Personality*, 5(3), 211–218.
- Nijenhuis, E. R. S., den Boer, J. A. (2007). Psychobiology of traumatization and trauma-related structural dissociation. In E. Vermetten, M. Dorahy & D. Spiegel (Eds.), *Traumatic dissociation: Neurobiology and treatment* (pp. 219–237).
- Nijenhuis, E. R. S., Spinhoven, P., Vanderlinden, J., van Dyck, R., & Van der Hart, O. (1998). Somatoform dissociative symptoms as related to animal defensive reactions to predatory imminence and injury. *Journal of Abnormal Psychology*, 107(1), 63–73.
- Nijenhuis, E. R. S., Vanderlinden, J., & Spinhoven, P. (1998). Animal defensive reactions as a model for trauma-induced dissociation reactions. *Journal of Traumatic Stress*, 11(2), 243–260.
- Nijenhuis, E. R. S., Van der Hart, O. (2011). Dissociation in Trauma: A new definition and comparison with previous formulations. *Journal of Trauma and Dissociation*, 14(4), 416–445.
- Nijenhuis, E. R. S., Van der Hart, O., & Kruger, K. (2002). The psychometric characteristics of the traumatic experiences checklist (TEC): First findings among psychiatric outpatients. *Clinical Psychology and Psychotherapy*, 9, 200–210.
- Nijenhuis, E. R. S., Van Engen, A., Kusters, I., & Van der Hart, O. (2001). Peritraumatic somatoform and psychological dissociation in relation to recall of childhood sexual abuse. *Journal of Trauma and Dissociation*, 2(3), 47–66.
- Norušis, M. J. (2011). IBM SPSS statistics 19 statistical procedures companion. Prentice Hall: Upper Saddle River, NJ.
- Noyes, R., Hoenk, P. R., Kuperman, S., & Slymen, D. J. (1977). Depersonalization in accident

- victims and psychiatric patients. *The Journal of Nervous and Mental Disease*, 164(6), 401–407.
- Noyes, R., & Kletti, R. (1977). Depersonalization in response to life-threatening danger. *Comprehensive Psychiatry*, 18(4), 375–384.
- Noyes, R., & Kletti, R. (1980). The experience of dying from falls. In R. A. Kalish (Ed.), *Death, dying, transcending* (pp. 129–136). Farmingdale, NY: Baywood Publishing Company.
- Noyes, R., & Slymen, D. J. (1978–79). The subjective response to life-threatening danger. *Omega*, 9(4), 313–321.
- Oakley, D. A. (2012). Hypnosis, trance and suggestion: Evidence from neuroimaging. In M. Nash & A. Barnier (Eds.), *The oxford handbook of hypnosis* (pp. 365–392). New York, NY: Oxford University Press.
- Ogden, P., Minton, K., & Pain, C. (2006). *Trauma and the body: A sensorimotor approach to psychotherapy*. New York, NY: W. W. Norton.
- Öhman, A., Hamm, A., & Hugdahl, K. (2000). Cognition and the autonomic nervous system: Orienting, anticipation, and conditioning. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of Psychophysiology* (2nd ed., pp.533–575). New York, NY: Cambridge University Press.
- Overland, G. (2011). Generating theory, biographical accounts and translation: A study of trauma and resilience. *International Journal of Social Research Methodology*, 14(1), 61–75.
- Ozer, E. J., Best, S. R., Lipsey, T. L., & Weiss, D. S. (2003). Predictors of posttraumatic stress disorder and symptoms in adults: A meta-analysis. *Psychological Trauma: Theory, Research, Practice, and Policy*, 5(1), 3–36.
- Panasetis, P., & Bryant, R. A. (2003). Peritraumatic versus persistent dissociation is acute stress

- disorder. *Journal of Traumatic Stress*, 16(6), 563–566.
- P Dell. (2010a, September 17). The evolutionary link between trauma and dissociation. [Web log post]. Retrieved from <http://understandingdissociation.com/2010/09/17/the-evolutionary-link-between-trauma-and-dissociation/>
- P Dell. (2010b, October 26). Disentangling animal defenses from dissociation: Part II [Web log post]. Retrieved from <http://understandingdissociation.com/2010/10/26/disentangling-animal-defenses-from-dissociation-part-ii/>
- P Dell. (2010c, November 4). Disentangling animal defenses from dissociation: Part III [Web log post]. Retrieved from <http://understandingdissociation.com/2010/11/04/disentangling-animal-defenses-from-dissociation-part-iii/>
- P Dell (2011, January 5). OK, What Is Peritraumatic Dissociation—Really? [Web log post]. Retrieved from <http://understandingdissociation.com/2011/01/05/ok-what-is-peritraumatic-dissociation-really/>
- Pekala, R. J., & Kumar, V. K. (2000). Operationalizing “trance” I: Rationale and research using a psychophenomenological approach. *American Journal of Clinical Hypnosis*, 43(2), 107–135. doi:10.1080/00029157.2000.10404265
- Perry, B. D., Pollard, R. A., Blakley, T. L., & Vigilante, D. (1995). Childhood trauma, the neurobiology of adaptation, and “use-dependent” development of the brain: How “states” become “traits.” *Infant Mental Health Journal*, 16(4), 271–291.
- Pett, M. A., Lackey, N. R., & Sullivan, J. J. (2003). *Making sense of factor analysis*. Thousand Oaks, CA: Sage Publications, Inc.
- Pole, N., Cumberbatch, E., Taylor, W. M., Metzler, T. J., Marmar, C. R., & Neylan, T. C. (2006). Comparisons between high and low peritraumatic dissociators in cardiovascular

- and emotional activity while remembering trauma. *Journal of Trauma and Dissociation*, 6(4), 51–67.
- Porges, S. W. (1995). Cardiac vagal tone: A physiological index of stress. *Neuroscience and Biobehavioral Reviews*, 19, 225–133.
- Porges, S. W. (2004). Neuroception: A subconscious system for detecting threats and safety. *Zero to Three*, 24(5), 19–24.
- Putnam, F. W. (1989). Pierre Janet and modern views of dissociation. *Journal of Traumatic Stress*, 2(4), 413–429.
- Rainville, P., Duncan G. H., Price, D. D., Carrier B., & Bushnell, M. C. (1997). Pain affect encoded in human anterior cingulate but not somatosensory cortex. *Science*, 277(5328), 968–971.
- Rainville, P., Hofbauer, R. K., Bushnell, M. C., Duncan, G. H., & Price, D. D. (2002). Hypnosis modulates activity in brain structures involved in the regulation of consciousness. *Journal of Cognitive Neuroscience*, 14(6), 887–901.
- Ratner, S. C. (1967). Comparative aspects of hypnosis. In J. E. Gordon (Ed.), *Handbook of clinical and experimental hypnosis* (pp. 550–587). London: Macmillan Company.
- Ratner, S. C. (1977). Immobility of invertebrates: What can we learn?. *The Psychological Record*, 1(1–13).
- Raz, A., Fan, J., & Posner, M. I. (2006). Neuroimaging and genetic associations of attentional and hypnotic processes. *Journal of Physiology Paris*, 99, 483–491.
- Rhue, J. W., Lynn, S. J., Henry, S., Buhk, K., & Boyd, P. (1990–91). Child abuse, imagination, and hypnotizability. *Imagination, Cognition and Personality*, 10(1), 53–63.
- Roberts, G., & Owen, J. (1988). The near-death experience. *British Journal of Psychiatry*, 153,

607–617.

Rocha-Rego, V., Fiszman, A., Portugal, L. C., Pereira, M. G., de Oliveira, L., Mendlowicz, M. V.

... Volchan, E. (2009). Is tonic immobility the core sign among conventional peritraumatic signs and symptoms listed for PTSD?. *Journal of Affective Disorders*, 115, 269–273.

Roche, S. M., & McConkey, K. M. (1990). Absorption: Nature, assessment, and correlates.

Journal of Personality and Social Psychology, 59(1), 91–101.

Ross, C. A. (2007). *Moon shadows: Stories of trauma and recovery*. Richardson, TX: Manitou Communications, Inc.

Russell, D. E. H. (1974). *The politics of rape: The victim's perspective*. New York, NY: Stein & Day.

Salmon, K., & Bryant, R. A. (2002). Posttraumatic stress disorder in children: The influence of developmental factors. *Clinical Psychology Review*, 22, 163–188.

Salvador, S., & Chan, P. (n.d.). *Determining the number of clusters/segments in hierarchical clustering/segmentation algorithms*. Retrieved from <http://cs.fit.edu/~pkc/papers/ictai04salvador.pdf>

Sambandam, R. (2003). Cluster analysis gets complicated. *Marketing Research*, 15(1), 16–21.

Schmahl, C., & Bohus, M. (2007). Translational research issues in dissociation. In E. Vermetten, M. Dorahy & D. Spiegel (Eds.), *Traumatic dissociation: Neurobiology and treatment* (pp. 121–138).

Schultz, L. (1974). *Rape victimology*. Charles C Thomas: Springfield, IL.

Sheppard, A. G. (1996). The sequence of factor analysis and cluster analysis: Differences in segmentation and dimensionality through the use of raw and factor scores. *Tourism*

Analysis, 1, 49–57.

Shilony, E., & Grossman, F. K. (1993). Depersonalization as a defense mechanism in survivors of trauma. *Journal of Traumatic Stress, 6*, 119–128.

Sierra, M., & Berrios, G. E. (1998). Depersonalization: Neurobiological perspectives. *Society of Biological Psychiatry, 44*, 898–908.

Simeon, D., Guralnik, O., Gross, S., Stein, D. J., Schmeidler, J., & Hollander, E. (1998). The detection and measurement of depersonalization. *The Journal of Nervous and Mental Disease, 186*, 536–542.

Skinner, H. A. (1981). Toward the integration of classification theory and methods. *Journal of Abnormal Psychology, 90*(1), 68–87.

Skinner, H. A., & Blashfield, R. K. (1982). Increasing the impact of cluster analysis research: The case of psychiatric classification. *Journal of Consulting and Clinical Psychology, 50*(5), 727–735.

Smid, G. E., Mooren, T. T. M., van der Mast, R. C., Gersons, B. P. R., & Kleber, R. J. (2009). Delayed posttraumatic stress disorder: Systematic review, meta-analysis, and meta-regression analysis of prospective studies. *The Journal of Clinical Psychiatry, 70*(11), 1572–1582.

Spiegel, D. (1986). Dissociating damage. *American Journal of Clinical Hypnosis, 29*(2), 123–131.

Spiegel, D. (1991). Neurophysiological correlates of hypnosis and dissociation. *Journal of Neuropsychiatry, 3*(4), 440–445.

Spiegel, D. (2012). Intelligent design or designed intelligence? Hypnotizability as neurobiological adaptation. In M. Nash & A. Barnier (Eds.), *The oxford handbook of*

- hypnosis* (pp. 179–199). New York, NY: Oxford University Press.
- Stecker, T. (2011). *5 survivors: Personal stories of healing from PTSD and traumatic events*. Center City, MN: Hazeldon Foundation.
- Steele, K., Dorahy, M. J., van der Hart, O., & Nijenhuis, E. R. S. (2009). Dissociation versus alterations of consciousness: Related but different concepts. In P. F. Dell & J. A. O’Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. 155–169). New York, NY: Routledge.
- Stein, D. J., Koenen, K. C., Friedman, M. J., Hill, E., McLaughlin, K. A., Petukhova, M.,...Kessler, R. C. (2013). Dissociation in posttraumatic stress disorder: Evidence from the World Mental Health Surveys. *Biological Psychiatry*, 73, 302–312.
doi:10.1016/j.biopsych.2012.08.022
- Stevens, J. (1986). *Applied multivariate statistics for the social sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Suarez, S. D., & Gallup, G. G. (1979). Tonic immobility as a response to rape in humans: A theoretical note. *The Psychological Record*, 29, 315–320.
- Sugar, C. A., & James, G. M. (2003). Finding the number of clusters in a dataset: An information-theoretic approach. *Journal of the American Statistical Association*, 98(463), 750–763. doi:10.1198/016214503000000666
- Susa (Art Cathartic on FB). (2010, September 17). Re: The evolutionary link between trauma and dissociation [Web log comment]. Retrieved from
<http://understandingdissociation.com/2010/09/17/the-evolutionary-link-between-trauma-and-dissociation/>
- Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences

- (“absorption”), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology*, 83(3), 268–277.
- Tolson, L. C. (2003). *Beyond the tears: A true survivor's story*. Bloomington, IN: AuthorHouse.
- Tromp, S., Koss, M. P., Figueredo, A. J., & Tharan, M. (1995). Are rape memories different? A comparison of rape, other unpleasant, and pleasant memories among employed women. *Journal of Traumatic Stress*, 8(4), 607–627.
- Tsakiris, M., Costantini, M., Haggard, P. (2008). The role of the right temporo-parietal junction in maintaining a coherent sense of one's body. *Neuropsychologia*, 46, 3014–3018.
doi:10.1016/j.neuropsychologia.2008.06.004
- Tsakiris, M., Hesse, M. D., Boy, C., Haggard, P., & Fink, G. R. (2007). Neural signatures of body ownership: A sensory network for bodily self-consciousness. *Cerebral Cortex*, 17, 2235–2244. doi:10.1093/cercor/bhl131
- Ursano, R. J., Fullerton, C. S., & Bendek, D. M. (2007). Peritraumatic dissociation: Time perception and cerebellar regulation of psychological, interpersonal, and biological processes. In E. Vermetten, M. Dorahy & D. Spiegel (Eds.), *Traumatic dissociation: Neurobiology and treatment* (pp. 181–190).
- Van der Hart, O., Nijenhuis, E. R. S., & Steele, K. (2006). *The haunted self: Structural dissociation and the treatment of chronic traumatization*. New York, NY: W. W. Norton & Company, Inc.
- Van der Hart, O., van Ochten, J. M., van Son, M. J. M., Steele, K., & Lensvelt-Mulders, G. (2008). Relations among peritraumatic dissociation and posttraumatic stress: A critical review. *Journal of Trauma and Dissociation*, 9(4), 481–505.
- Van der Velden. P. G., Kleber, R. J., Christiaanse, B., & Gersons, B. P. R. (2006). The

- independent predictive value of peritraumatic dissociation for postdisaster intrusions, avoidance reactions, and PTSD symptom severity: A 4-year prospective study. *Journal of Traumatic Stress, 19*(4), 493–506. doi:10.1002/jts.20140
- Van der Velden, P. G., & Wittmann, L. (2008). The independent predictive value of peritraumatic dissociation for PTSD symptomatology after type I trauma: A systematic review of prospective studies. *Clinical Psychology Review, 28*, 1009–1020. doi:10.1016/j.cpr.2008.02.006
- Vermetten, E., & Bremner, D. J. (2004). Functional brain imaging and the induction of traumatic recall: A cross-correlational review between neuroimaging and hypnosis. *The International Journal of Clinical and Experimental Hypnosis, 52*(3), 280–312.
- Vermetten, E., Bremner, D. J., & Spiegel, D. (2002). Dissociation and hypnotizability: A conceptual and methodological perspective on two distinct concepts. In J. D. Bremner, & C. R. Marmar (Eds.), *Trauma, memory, and dissociation* (pp. 107–151). Washington, DC: American Psychiatric Publishing, Inc.
- Vermetten, E., & Spiegel, D. (2007). Perceptual processing and traumatic stress: Contributions from hypnosis. In E. Vermetten, M. Dorahy & D. Spiegel (Eds.), *Traumatic dissociation: Neurobiology and treatment* (pp. 103–119).
- Vianna, D. M. L., & Brandão, M. L. (2003). Anatomical connections of the periaqueductal gray: Specific neural substrates for different kinds of fear. *Brazilian Journal of Medical and Biological Research, 36*, 557–566.
- Volchan, E., Souza, G. C., Franklin, C. M., Nortre, C. E., Rocha-Rego, V., Oliveira, J. M. ... Figueira, I. (2011). Is there tonic immobility in humans? Biological evidence from victims of traumatic stress. *Biological Psychology, 88*, 13–19.

- Waelde, L. C., Silvern, L., Carlson, E., Fairbank, J. A. & Kletter, H. (2009). Dissociation in PTSD. In P. F. Dell & J. A. O'Neil (Eds.), *Dissociation and the dissociative disorders: DSM-V and beyond* (pp. 447–456). New York, NY: Routledge.
- Waller, N. G., Putnam, F. W., & Carlson, E. B. (1996). Types of dissociation and dissociative types: A taxometric analysis of dissociative experiences. *Psychological Methods*, 1(3), 300–321.
- Ward, J. H. (1963). Hierarchical grouping to optimize an objective function. *Journal of the American Statistical Association*, 58(301), 236–244.
- Warner, R. M. (2013). *Applied statistics* (2nd ed.). Thousand Oaks, CA: SAGE Publications, Inc.
- Way, K. G. (2006). How metaphors shape the concept and treatment of dissociation. *Psychiatric Clinics of North America*, 29, 27–43. doi:10.1016/j.psc.2005.10.006
- Wessely, S., Bryant, R. A., Greenberg, N., Earnshaw, M., Sharpley, J., & Hughes, J. H. (2008). Does psychoeducation help prevent post traumatic psychological distress? *Psychiatry*, 71(4), 287–302.
- Yeager, K. R., Roberts, A. R. (2003). Differentiating among stress, Acute Stress Disorder, crisis episodes, trauma, and PTSD: Paradigm and treatment goals. *Brief Treatment and Crisis Intervention*, 3(1), 3–25.
- Young, L. (1992). Sexual abuse and the problem of embodiment. *Child Abuse & Neglect*, 16, 89–100.
- Zoellner, L. A. (2008). Translational challenges with tonic immobility. *Clinical Psychology: Science and Practice*, 15, 98–101.