Chronic Psychological and Psychophysiological Sequelae
Among Adolescents Following a Traumatic Bus Crash

by

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Abstract
This study examined chronic psychological and psychophysiological post-traumatic sequelae among eleven adolescent survivors of a fatal bus crash by means of a multi-method strategy. Measures included a structured DSM-III-R post-traumatic stress disorder (PTSD) interview using the Diagnostic Interview for Children and Adolescents-Revised (DICA-R), self-report measures of PTSD symptoms with the Reaction Index, and the Impact of Events Scale. Other measures of stress-related symptomatology included the State-Trait Anxiety Inventory, Fear Survey Schedule-II, Anxiety Sensitivity Index, Anxiety Frequency Index, and Beck Depression Inventory. In addition, heart rate (HR) reactivity to mental arithmetic (MA), demographic questions, and crash questions was assessed. Survivors were compared to control subjects matched for age, gender, race, and socioeconomic status, among other demographic characteristics. Multivariate analyses of the psychiatric interview data indicated that survivors evidenced significantly higher levels of past PTSD symptoms experienced after the crash, with a significant group by gender interaction, $F(3,17) = 5.22, p = .01$. Current (past month) levels of PTSD symptoms were also significantly higher among survivors four years after the crash, $F(3,17) = 8.82, p < .01$, although PTSD symptomatology decreased overall during that time, $F(3,17) = 15.52, p < .01$. Survivors and controls did not differ significantly on other measures of PTSD and other stress-related symptomatology. Repeated measures analyses of HR response scores revealed greater HR reactivity to questions about the crash among survivors, $F(1, 14) = 18.55, p < .01$, and by gender, $F(1, 14) = 5.21, p = .04$. Similar analyses found greater variability in survivors’ HR standard deviations (an index of autonomic lability) $F(1,14) = 5.21, p = .03$ in response to the crash interview. Survivors’ HR did not differ from controls’ on the MA task. Findings are discussed theoretically and methodologically within the contexts of neurological and conditioning models of PTSD. No relationship between HR reactivity and psychiatric symptomatology was found. Furthermore, this investigation did not find support for the neurological kindling theory. Areas of future research using psychophysiological assessment are proposed to more specifically elicit autonomic arousal. Detailed case studies of four individual response patterns are included as a heuristic for further physiological research and for clinical applications with adolescent trauma victims.
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The historic traces of this study begin rather faintly in the distant past, angling in from many directions and circumstances, much like streams of water feed into one another to eventually become a broad and channeled river. The tributary which is the clearest and can be traced the furthest is that with Russell Jones at the source. He routed my interests into the area of child stress research initially, and has continued to feed into that mainstream interest along the way. As my enthusiasm for stress studies swelled, Steve Giles at the Mountain Home VAMC built a vital bridge to connect me with Linda Probus. Linda became the main conduit through whom it became possible for me to contact the courageous survivors of the church bus crash. These eleven young people were the wellspring of the critical data summarized herein. I respect each one of you for having the courage to tell your stories, and I humbly thank you for sharing them with me.

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Introduction

This study examined long-term post-traumatic sequelae among adolescent survivors of a traumatic bus crash. A multi-method strategy included: (1) a structured psychiatric interview; (2) self-report measures of re-experiencing, psychic numbing, increased arousal, depression, anxiety, fear, and physiological symptoms; and (3) psychophysiological assessment of increased arousal in response to stimuli associated with the trauma and stimuli not associated with the trauma. Bus crash survivors’ responses were compared to those of a group of control subjects matched for age, sex, race, and socioeconomic status (SES).

The Problem

PTSD is the diagnostic label for a constellation of symptoms that may develop in victims of various traumatic events. The Diagnostic and Statistical Manual, 3rd Edition (DSM-III; American Psychiatric Association) formally recognized PTSD in 1980. Since that time, there has been a tremendous increase in information about the etiology, assessment, and treatment of PTSD following exposure to a wide variety of traumatic events, including combat, rape, sexual abuse, natural disasters, vehicular accidents, industrial accidents, war, etc. Despite recent research, however, objective measures of PTSD are in their infancy (Eldridge, 1991; Lyons, Gerald, Wolfe, & Keane, 1988).

Clinical research on the assessment of PTSD and reaction to trauma has focused on determining reliable and valid methods for measuring the severity of reactions to traumatic events (Carroll, Foy, Cannon, & Zwier, 1991). One of the most salient findings in the PTSD research is that trauma reactions can be chronic, lasting many years or a lifetime after experiencing a traumatic event (Baum, 1990; Horowitz, 1974). In part, the psychiatric diagnosis of PTSD requires the presence of persistent symptoms of hyperarousal such as insomnia, hypervigilance, autonomic reactivity, and exaggerated startle responses (DSM-III-R; American Psychiatric Association, 1987). According to Baum (1990), the persistent nature of hyperarousal symptoms affects appearance and maintenance of many re-experiencing phenomena that distinguish PTSD from other anxiety or dissociative disorders.

Reliability of self-report. A major problem with the diagnosis of PTSD is in objectively verifying the presence or absence of symptoms and the degree to which they
are present. The PTSD literature has consistently called for a multi-method assessment strategy, using the following five methods: (1) structured clinical interview; (2) determination of pretrauma history and functioning; (3) psychometric assessment; (4) collection of behavioral and physiological response data; and (5) review of archival information (Foy, Resnick, Carroll, & Osato, 1990; Lyons, 1987; Solomon, 1989). However, most of the instruments used to assess stress symptomatology in children have been structured interviews (e.g., DICA-R: Reich & Welner, 1990), self-report measures of depression and anxiety such as the Revised Children's Manifest Anxiety Scale (R-CMAS; Reynolds & Richmond, 1978; Saigh, 1989a), the Child Depression Inventory (CDI; Kovacs, 1981; see Saigh, 1989b) or self-report instruments developed and validated with adult populations, such as the Impact of Event Scale (IES; Horowitz, Wilner, & Alvarez, 1979; Malmquist, 1986; Yule & Williams, 1990).

In a study of disaster effects among children, Earls, Smith, Reich, and Jung (1988) cautioned that structured interviews used with children, such as the Diagnostic Interview for Children and Adolescents (DICA; Herjanic & Reich, 1982) may obtain high prevalence rate of disorders identified through children's reports of psychiatric symptoms, because children tend to over-report subjective symptoms. They asserted that there is a tendency for the structured interview method to yield more children with multiple psychiatric diagnoses than is usually produced in a clinical examination. In addition, Pynoos and Nader (1988) argued that another problem with the reliability of children's self-report of symptoms is that they may not make general statements about their emotional state. It may be difficult, therefore, to estimate the prevalence or severity of certain PTSD symptoms. These conclusions underscore the need for more objective and reliable indicators of the impact of trauma, especially in the diagnosis of PTSD in children and adolescents.

Many investigations (e.g., Applebaum & Burns, 1991; Green, Korol, Grace, Vary, Leonard, Gleser, & Smitson-Cohen, 1991; Malmquist, 1986; Yule & Williams, 1990) have relied primarily upon self-report of post-traumatic symptoms on instruments such as the Impact of Events Scale (Horowitz et al., 1979), structured interviews such as the DICA-R (Reich & Welner, 1990), and parent or teacher reports. There are many problems concerning the validity of self-reported subjective and/or somatic experiences in children, adolescents, and adults. Response bias, interviewer expectancies, developmentally based difficulty in understanding task demands, difficulty in understanding the meaning of questions and potential outcomes of
responses to clinical interviews, malingering, or the potential for secondary gain are a few problems associated with self-report assessment strategies.

Solomon and Canino (1990) speculated that many avoidance and arousal symptoms of PTSD may be under-reported because victims of trauma may not see a connection between his/her symptoms and the traumatic event he or she experienced. In other words, the measures used to detect some PTSD symptomatology, including arousal symptoms, are flawed. The inability to link symptomatology with the traumatic event may be more difficult for children. What is lacking is an objective validation of the presence or absence of post-traumatic symptoms in children and adolescents (see also Wolfe & Keane, 1990).

Various studies examining PTSD in children and adolescents yield mixed findings. Some, such as Yule and Williams (1990), have found considerable support for the presence of PTSD in child and adolescent victims, whereas others, such as Green et al. (1991) and Quarantelli (1985) have found contradicting evidence, both for and against PTSD in child and adolescent victims. Again, the uncertainty of the validity of PTSD diagnosis in children and adolescents may be due to the inadequacy of instruments used to assess the presence or severity of the disorder in children and adolescents.

Reliability of biological indices. Biological approaches to the diagnosis of PTSD have recently received increased attention from researchers and clinicians as means of validating the disorder. Research findings have suggested that individuals with PTSD evidence marked abnormalities in sympathetic nervous system arousal, hormonal function, and sleep and dream physiology (Friedman, 1991). Many aspects of the physiologic components of PTSD have been assessed in adults, primarily combat veterans (e.g., Breden, 1982; Malloy, Fairbank, & Keane, 1983). Recent studies demonstrate that PTSD also occurs in children exposed to a life-threatening event (Pynoos, Frederick, Nader, Arroyo, Steinberg, Eth, Nunez, & Fairbanks, 1987; Yule & Williams, 1991). To date, however, only one study has systematically and experimentally examined physiological hyperarousal (startle modulation) in children with PTSD (i.e., Ornitz & Pynoos, 1989).

Many studies (Breden, 1982; Foy et al., 1987; Kolb, Burris, & Griffths, 1984; Malloy et al., 1983) have demonstrated that persistent hyperarousal is a reliably observed phenomenon among adults who show significant evidence of PTSD as assessed with various psychometric and clinical interview instruments. Other than
physiological reactivity, no biological tests that have clinical utility in the diagnosis or monitoring of treatment response in PTSD exist (Rosen & Bohon, 1988). Adults in both acute and long-term phases of the post-trauma period exhibit persistent hyperarousal symptoms (Davidson, O'Keefe, Weiss, & Baum, 1990; Solomon & Canino, 1990). These findings suggest that various stressful events may be associated with long-term or chronic effects, even long after the offset of the original, external stressor (Baum, 1990).

The child and adolescent PTSD literature has almost wholly overlooked persistent hyperarousal symptoms, although they are considered an essential component of a clinical diagnosis of PTSD. Psychophysiological assessment has been integral in the study of adult responses to traumatic events, such as exposure to combat in Vietnam veterans. On the other hand, concerning children, the failure to use psychophysiological assessment strategies has been consistently noted (Beidel, 1991).

A review of the literature (Beidel, 1989) revealed several interesting findings about the psychophysiological assessment of children. First, with due consideration to the child's cognitive and physical development, reliable psychophysiological data can be collected from children. Second, children do respond to anxiety-producing events with changes within various physiological parameters. Third, under specific challenge conditions, certain responses appear to be enduring characteristics. Finally, recent findings suggest that some of these responses may be related to a stable predisposition. Such responses appear to remain fairly constant during a time of rapid physical and cognitive maturation (see Matthews, Rakaczky, Stoney, & Manuck, 1987).

The implications of the unreliability of self-report of stressful life events for assessing the self-reported incidence of intrusive, avoidance, and hyperarousal symptoms in PTSD research are clear. Fairbank, Keane, & Malloy (1983) encourage the use of multi-method approaches to assess PTSD in adult Vietnam veterans, including psychometric assessment, clinical interviews, and psychophysiological assessment. They have demonstrated the utility of psychophysiological assessment in discriminating between clinically impaired, and faking bad veterans (Pary, Tobias, & Lippman, 1987; Sparr & Pankrantz, 1983).

Unlike the subjective reports of re-experiencing, numbing, or arousal symptoms, various stimuli can elicit symptoms of hyperarousal that can be measured in the laboratory, providing an objective method of validating the disorder and monitoring its response to treatment (Keane, Wolfe, & Taylor, 1987). Research on the validity of
PTSD diagnosis suggests that children’s and adolescents’ self-reported symptoms need to be evaluated considering psychophysiological indicators.

Definitions

The following section contains a brief survey of terms and conceptualizations relevant to traumatic events, traumatic stress, and their interaction about the PTSD diagnosis. In addition, the basic DSM-III-R criteria for PTSD are presented in Appendix A-1.

Traumatic events. Terr (1985) identified several characteristics unique to traumatic events that lead to psychic trauma. First, the event must be beyond that which would be ordinarily expected during the course of a lifetime. Second, the event must be a real event that is surprising, unanticipated, and piercingly intense. In a similar manner, DSM-III-R defines a traumatic event as "an event that is outside the range of usual human experience and that would be markedly distressing to almost anyone" (p. 250).

In addition, the DSM lists a range of potentially traumatic events that most probably would elicit a stressful response from witnesses or victims, such as serious threat to one’s life or physical integrity; serious threat or harm to one’s children, spouse, or other close relatives and friends; sudden destruction of one’s home or community; or seeing another person who has recently been, or is being, seriously injured or killed as the result of an accident or physical violence.

Traumatic stress. The concept of stress has been defined in numerous ways. Some researchers have defined stress as an individual’s response to environmental events (e.g., Seiye, 1978; Terr, 1985). For example, Terr (1985) has used the following statement to define an individual’s response to a traumatic event, which she termed psychic trauma:

"... the emotional condition following from a sudden, unexpected, and intense external blow that overwhelms crucial coping and defensive operations, temporarily rendering the individual helpless."

Beth and Pynoos (1985, p. 38) defined psychic trauma as the resulting "helplessness in the fact of intolerable danger, anxiety, and instinctual arousal" following the exposure of an individual to "an overwhelming event." Others have defined stress as the environmental event itself, such as rape, combat, accident, or
surgery. Yet other definitions of stress emphasize procedural variables such as deprivation of food or sleep. Lazarus (1967) has defined stress as an interaction of environmental events and the person’s appraisal of the threat posed by those events. The interactional definition of stress has become increasingly well accepted in the psychological literature (Keane, 1985).

Behavioral Conceptualization of PTSD

Development of PTSD. Behavioral conceptualizations of PTSD (Baum, O’Keeffe, & Davidson, in press; Foa, Steketee, & Rothbaum, 1989; Keane, 1989; Keane, Zimerling, & Caddell, 1985; Keane, Fairbank, Caddell, & Zimerling, 1989; Lyons, 1987) have adopted Mower’s two-factor theory (a classically conditioned emotional response and subsequent avoidance responses motivated by fear, reinforced by fear reduction) as the most adequate explanation of the origin and persistence of PTSD symptoms (Foy et al., 1990). The learning model views an experience such as a severe bus crash as a noxious unlearned or unconditioned stimulus (UCS) which elicits an automatic or unconditioned response (UCR) of extreme anxiety, including physiological, behavioral, and cognitive components. Other, previously neutral stimuli present in the situation may become learned or conditioned stimuli (CS’s) capable of eliciting a conditioned anxiety response (CR) because of its initial pairing with the UCS (see McAllister & McAllister, 1969). Thus, previously neutral stimuli acquire the capacity to elicit conditioned emotional responses (CER’s) in the absence of the original UCS. Resistance to extinction of the anxiety response (CR) is due to continued avoidance of trauma-associated cues (CS’s). Fear reduction follows, reinforcing the anxiety response. Furthermore, thoughts or recollections about a stressful experience may evoke stress responses long after the stressor disappears (Baum, O’Keeffe, & Davidson, in press).

According to McAllister and McAllister (1969), fear is an internal, unobservable response measured indirectly through observable responses such as GSR, HR, or change in the rate of ongoing behavior, etc. Some common behavioral approaches to the measurement of fear responses include: (1) learning to escape fear; (2) change in performance resulting from conditioned punishment; (3) change in the rate of an ongoing response; and (4) change in the magnitude of an unlearned response.

Some studies of Vietnam veterans used variations of the latter two paradigms to assess the magnitude of fear (e.g., Foy, Carroll, & Donahoe, 1987). Presenting a
stimulus previously paired with an aversive stimulus during the performance of some ongoing response leads to a change in the rate of that response, thus providing an index of fear. In the combat-related PTSD literature, this parallels the technique of taking a baseline measure of physiological responses (e.g., HR, GSR, respiration, etc.), which are the ongoing responses. Combat-related sounds and visual images are presented to the subjects. The change in HR or GSR, etc., thus serves as the index of the degree of learned fear responses.

In a similar paradigm, the change in the magnitude of an unlearned response indexes fear by the effect of a fear-eliciting stimulus on performing an unlearned response. Beidel (1988) used this technique to assess anxious emotional states in children. She assessed the performance of test anxious children on timed vocabulary tests and oral reading sessions. The fear-eliciting stimuli in this example are, of course, the test situations, and performance of an unlearned response is the accuracy and/or speed of performance on the vocabulary test and reading task.

Here, PTSD is conceptualized as a learned fear response with both instrumental and classically conditioned components. This PTSD study used both of the aforementioned paradigms. First, baseline HR provided an ongoing physiological response. Then questions related to the original UCS (the crash) were introduced, causing a change in the rate of the ongoing HR response. The degree of change in HR thus reflected the degree of fear experienced. Second, the change in the magnitude of an unlearned response was assessed by comparing the accuracy of mental arithmetic responses (unlearned response) given by trauma-exposed subjects to those of non-exposed control subjects.

**Maintenance of PTSD.** According to principles of learning, several factors contribute to the maintenance of anxiety and distress in traumatized individuals. Foy et al. (1990) have suggested that, by the process of stimulus generalization, new stimuli that are similar to the CS's that elicit anxiety may also acquire the capacity to elicit anxiety and distress. For example, sights and sounds similar to those occurring during and after the crash, but which occur independently of the traumatic event, may elicit anxiety and distress behavior. Higher-order conditioning is a process in which currently neutral stimuli are paired with CS's, such as cognitions about the event, and thus acquire an independent capacity to elicit fear. As McAllister and McAllister (1969) explained, the fear response has stimulus properties, which in turn elicit other responses. These secondary and tertiary responses then become classically conditioned
to the UCS and generalized components of the UCS, further extending the trauma’s impact into seemingly neutral aspects of daily life (see Foy et al., 1990).

Baum (1990) postulated that trauma victims continue to think about and relive the original trauma. Such behavior may help to understand chronic stress symptoms in the absence of an ongoing stressor. Each time the victim relives the trauma in memory, a form of the initial stress response or a new stress experience ensues (see Scurfield, 1990). Furthermore, an individual’s ability to inhibit distressing thoughts or recollection of the trauma determines the degree to which he or she experiences stress-related symptomatology, including hyperarousal. Thus, intrusive thoughts about the trauma may maintain other stress phenomena for long periods of time.

Davidson and Baum (1986) found evidence to support this hypothesis in a comparison of Vietnam combat veterans, non-combat veterans, and nonmilitary controls. They found that subjects who reported intrusive thoughts were also more likely to have more symptoms of PTSD. In multiple regression analyses, intrusive thoughts about combat accounted for 23% of the variance in symptom reporting. Davidson and Baum (1986) reported similar findings with Three Mile Island victims 40 months post-disaster, where reports of intrusive thoughts predicted physiological indices of chronic stress. These findings further support the notion that traumatic imagery plays a role in maintaining the stressful experience after the stressor ceases (Baum, 1990).

Surwit, Williams, and Shapiro (1982) proposed a model to attempt to explain the nature of appraisal processes that lead to the fight or flight response, which may shed some light on the processes that lead to re-experiencing the event. In essence, Surwit et al. (1982) proposed that an incoming novel stimulus results in alerting or orienting the organism. The organism then cognitively appraises the situation and the characteristics of the stimulus. The cognitive appraisal leads to formulating a decision about the stimulus’ significance to the organism. This decision can lead to one of two major outcomes. First, the appraisal can lead to emotional, motor, or mental work such as fear, anxiety, increased motor activity, increased cardiac output, muscle vasodilatation, or skin and viscera vasoconstriction. If the individual perceives the stimulus as dangerous or harmful, these reactions aid in the fight or flight response. If the stimulus requires mental work, increased arousal aids in recall and mental processing.

The other major outcome of the appraisal process occurs if the decision indicates that more information about the stimulus is desired. Then the organism
maintains an ongoing orientation of the relevant sense organs toward that stimulus in a sensory intake mode. In this state, the organism remains nonaffective, attentively alert, decreases motor activity and cardiac output, muscle vasoconstriction, skin and visceral vasoconstriction. It may be that the intensity of an event, the degree of danger and immediacy, its consequences, etc., affect perceptions of demand (Baum, 1990). In addition, if the event is unusually severe, or if thoughts regarding the event are particularly troubling, the stress of the event may increase. A traumatic episode appears to focus attention intensely on the essential aspects of the event. Hyperalertness is one of three common experiential factors reported in life-threatening situations. Attention to urgent stimuli facilitates an initial absorption in the event, with a decrease in reflective thought. This form of continuous attention affects emotional and cognitive processing, even in benign contexts (Spiegel & Cardeña, 1990).

The continuing or persistent nature of the event, even long after its offset, may be due to intrusive imagery. Furthermore, it is assumed that the orienting/alerting response pattern resulting from the sudden, unexpected impact of a severe trauma, such as a vehicular accident, is more likely to lead to the development of PTSD, particularly increased hyperarousal symptoms, which, in turn, may serve as CS's that elicit further stressful and intrusive thoughts and feelings (Baum, 1990; van der Kolk, 1988).

Cognitive Theories of PTSD

Foa, Steketee, and Rothbaum (1989) have argued that, over and above the environmental variables that lead to conditioned fear responses in victims of trauma, it is important to examine victims' perceptions of those variables. According to Veronen and Kilpatrick (1983), individuals attach meanings to events through the processes of cognitive appraisal and attribution. They assume that individuals need to understand their experiences and therefore continually make efforts to understand why events happen. Beliefs about one's actions or lack of actions in response to a traumatic situation may account for much of the psychological distress experienced by victims in the aftermath of a trauma.

The learned helplessness model has also been applied to cognitive theories of PTSD to explain why some victims become numb and passive following a trauma. Uncontrollable, aversive events lead to generalized beliefs about one's ability to control events. Victims may learn to believe that future responses in stressful situations may be unsuccessful, therefore they respond passively in a variety of situations. Individuals
seek to explain the occurrence of uncontrollable events within the context of three dimensions: (1) the source (internal-external); (2) the generality over time (stable-unstable); and (3) the generality across situations (global-specific). Those who attribute aversive events to internally-caused factors, which are perceived to be stable over time, and globally applicable across situations are more likely to experience pervasive distress than those who see the cause of the events to be more externally-caused and specific in time and situation (Foa et al., 1989).

The following chapter reviews the current literature on the symptoms of children and adolescents exposed to severe trauma. The validity of the PTSD classification as applied to children and adolescents is evaluated, followed by descriptions of the course and persistence of PTSD. In addition, the review of the literature highlights relevant research methods and assessment tools used in PTSD research among children and adolescents.
Review of the Literature

Course of PTSD in the Child and Adolescent Literature

According to Frederick (1985), victims of violently intrusive events are particularly prone to experience PTSD with long-term psychological problems. The following review of studies examines both the short-term and long-term sequelae of various types of traumas within the recent child and adolescent literature.

In a review of the early childhood stress literature, Garmezy and Rutter (1985) concluded that disturbances in children following a severe traumatic event are short-lived. In addition, they concluded that there was no need for a specific diagnostic category for PTSD for children, because there were no reports of children showing adult PTSD symptoms such as amnesia for the traumatic event, "psychic numbing," or intrusive flashbacks of the event. Quarantelli (1985) also hypothesized that mental health effects of disasters are short-lived and of little practical importance. Some studies have found evidence to support this notion, however, a large body of the recent literature on the impact of trauma on the mental health of children suggests that the effects may be long-term, or may even become increasingly prevalent over time.

Many studies of the consequences of disaster have been initiated within days, to weeks, or several months following a disaster. Another group of studies of reactions to trauma were initiated 8 months, a year, several years, to more than a decade after trauma. The following section addresses various types of post-traumatic symptoms and the degree to which they are present among various victims in both the short- and long-term, as defined by how long after the trauma the investigation was initiated.

Short-term and longitudinal studies of PTSD. Short-term reactions to traumatic events are defined as those which are evident within the first six months following trauma. According to Frederick (1985), the most common psychological and behavioral symptoms manifested in children across all traumatic events in the short-term are: sleep disorders (bad dreams), persistent thoughts of the trauma, belief that another trauma will occur, conduct disturbances, hyperalertness, and avoidance of symbolic situations or stimuli reminiscent of the traumatic event. Some of these symptoms may continue into long-term symptoms. Some of the following studies highlight the types of trauma-related symptoms experienced by children in the short-term. Other studies demonstrate the course of symptoms over time in longitudinal investigations of trauma-related phenomena.
Pynoos et al. (1987) reported the incidence of PTSD among 159 child witnesses of a sniper shooting in a school yard. They found that almost 40% of the children had no PTSD symptoms, 22% reported mild symptoms; and 38% had moderate to severe PTSD. Seventy-seven percent of the children who were closest to the event evidenced severe PTSD. Symptoms most frequently reported were: upset when thinks about event (76%), fear of recurrence (71%), often afraid when thinks of event (70%), avoids reminders (65%), jumpy/nervous/startles easily (63%), wish to avoid feelings (58%), intrusive thoughts (54%), bad dreams (46%), sleep disturbance (46%), intrusive imagery and sounds (45%), inter alia.

Milgram, Toubiana, Klingman, Raviv, and Goldstein (1988) found high levels of acute stress reactions among a sample of 675 13-year old children who either survived, witnessed, or heard about a bus crash involving their schoolmates one week prior to assessment. High percentages of children reported stress reactions: 70% reported frightening thoughts; 66%, fears it could happen to them; 66%, difficulty concentrating; somatic complaints, restlessness (39%), sleep disturbance (34%), etc. Thirty-nine percent of the children were classified as having a severe reaction to the incident. A nine-month follow-up found that the severity of response to the crash had diminished considerably (only 5.6% of subjects were classified as severe). However, a small number of subjects’ responses actually became more severe over time.

Pynoos, Nader, Frederick, Gonda, & Stuber (1988) found considerable persistence, even increase in post-trauma symptomatology at six months and one year following the sniper shooting. Eleven percent of children reported having dreams about the event at six months and again at one year; 8% reported seeing the murdered child again at six months--10% at one year; etc.

A number of additional studies have detailed the presence of trauma-related symptoms among children and adolescents in the short-term following a traumatic event, although they did not assess the presence or absence of PTSD symptomatology per se. Several studies are summarized here for review.

Over 800 children ages 7 to 12 were studied at 2, 8, and 26 months after a major bush fire in Australia (McFarlane, Policansky, & Irwin, 1987). They found increasing rates of behavioral problems (absenteeism, educational under-achievement, somatic complaints, anxiety, etc.) with the passing months. Sixty-four percent of subjects determined to be cases at 8 months post-disaster were still cases at 26 months. These findings suggest that a majority of children psychiatrically impaired at 8 months
after a disaster may need clinical intervention to prevent long-term morbidity. The findings also support the view that psychic trauma can have potentially chronic effects on children.

Galante and Foa (1986) reported disturbed behaviors exhibited by 300 first through fourth grade children a few days after a devastating earthquake. They observed extreme and exaggerated apathy, aggression, fears, and assault. After 18 months of therapeutic intervention, the frequency of observed behavioral disturbance dropped dramatically. The investigators questioned whether their behavioral screening instruments were sensitive enough to detect the long-term effects of the trauma.

**Long-term studies of PTSD.** Fearful reactions, sleep difficulties including nightmares, psychophysiological reactions, and avoidance of symbolic situations or stimuli reminiscent of the traumatic event are some of the many chronic trauma-related symptoms reported in the literature (Frederick, 1985). The following studies highlight the types of chronic symptoms experienced by children after a traumatic event.

One of the most extensive studies of children's reactions to severe stress was conducted by Terr (1983). Twenty-six children 5 to 14 years old were interviewed up to 15 months after their school bus had been commandeered by kidnappers. The kidnappers drove the children around for 11 hours in two boarded-up vans, then buried the children in a truck-trailer covered with dirt. They spent 16 hours buried alive, until some of the children dug out of the pit. All the children suffered moderate to severe post-traumatic sequelae. Furthermore, in a follow-up study four and five years after the kidnapping, every child continued to exhibit post-traumatic effects.

Earls et al. (1988) investigated the mental health effects of two disasters (flood and exposure to dioxin) on children aged 6 to 17, one year after the event. Using a structured psychiatric, diagnostic interview, the DICA, they found that ten percent of the children experienced symptoms severe enough to warrant a diagnosis of adjustment disorder following the flood. No children met the full criteria for a diagnosis of PTSD, but many children in the sample reported PTSD symptoms. Chronic re-experiencing symptoms, particularly nightmares and "feeling as though it was happening again" were endorsed by 25% of the children one year after the offset of the disasters.

Kinzie, Sack, Angell, Manson, and Rath (1986) found multiple post-traumatic symptoms present among Cambodian adolescents four to six years after leaving Cambodia. All students of Cambodian origin in a particular high school in Oregon (N
were interviewed after teachers expressed concern about the tendency for Cambodian students to exhibit unusual behaviors such as exaggerated startle reactions and compulsive retelling of the horrible events of the past. PTSD questions from the Diagnostic Interview Schedule (DIS; Robbins, Helzer, Croughan, Williams, & Spitzer, 1981) led to DSM-III diagnosis of PTSD. Six students reported very few symptoms, primarily because they escaped the Pol Pot massacres by moving to the United States. The major symptoms of post-traumatic stress reported by a large number of students included nightmares (55%), recurring dreams (50%), being easily startled (50%), trouble sleeping (40%), trouble concentrating (55%), feeling ashamed of being alive (70%), and avoiding memories of Cambodia (58%), and avoiding discussion of traumatic events (43%). Sixty-five percent of the traumatized students reported headaches. Fully 50% of the sample met the diagnosis for current PTSD four to six years after the offset of traumatic events.

In a three-year follow-up study of the Cambodian students examined above, Kinzie, Sack, Angell, Clarke, and Rath (1989) found that 27% of the subjects had met the diagnostic criteria for PTSD at both interviews. Forty-eight percent of the original subjects met the DSM-III-R criteria for PTSD eight to twelve years after the offset of the traumatic events. Of particular note, three subjects with PTSD at the first assessment improved. Five subjects without PTSD at the first assessment subsequently developed PTSD for the first time, supporting previous reports of latent onset of PTSD. Subjects with PTSD scored significantly higher on the IES intrusion and avoidance subscales than did those subjects without PTSD. Avoidance symptoms were persistent even in students without a clinical diagnosis of PTSD. These findings of persistent and stable PTSD symptoms lend considerable support to the validity of the concept of the disorder.

Data collected by Yule and Williams (1990) from 8- to 16-year old children after the sinking of the ferry boat Herald of Free Enterprise indicated that children have reported very high levels of distressing, recurrent, intrusive thoughts on the IES (Horowitz et al., 1979), even one year to 15 months after the event. Children evidenced difficulty in concentrating and sleeping. They also had experiences of feeling that the trauma was recurring, flashbacks, and fearful reactions to various stimuli reminding them of the trauma. On the IES, the mean intrusion and avoidance subscale scores and the mean total scores were well above the "high" level as defined by Horowitz (1982).
More recently, Applebaum and Burns (1991) have pointed out that children who witness [or hear about] violence are at risk for developing PTSD. They found support for this in a study of 20 children between the ages of 3 and 20 (mean age = 15.1 years) who had lost a sibling to homicide or accidental death. Several measures of PTSD were obtained, including self-report and parent-report of symptomatology. Forty-five percent of the children met the diagnostic criteria for PTSD based on self-report, whereas 40% received a diagnosis of PTSD based on parent report. Ninety-five percent of the surviving siblings self-reported six or more PTSD symptoms (the minimum number of symptoms out of a total of 17 to meet the diagnostic requirements of PTSD). Forty-five percent reported more than ten symptoms. Only one surviving sibling scored in the "doubtful" range in terms of severity of PTSD symptomatology; 35% were in the "mild" range, 45% in the "moderate" range, and 15% in the "severe" range. Moreover, the most commonly reported symptoms were estrangement from others (an "avoidance" symptom), reported by 95% of the siblings, physiological distress at symbolic events (85%), and intrusive thoughts (80%). Parents reported that difficulty sleeping (60%), irritability (50%), foreshortened future (50%), and nightmares (50%) were the most common symptoms observed in the surviving siblings.

A number of additional studies have confirmed the persistence of trauma-related symptoms among children and adolescents one year or more after a traumatic event, although they did not assess the presence or absence of PTSD symptomatology per se. Several studies are summarized here for review.

Kristal (1978) examined the concept of "latent traumatic neurotic responses" in children ages 10 to 12 years four years after the onset of shelling, and 18 to 20 months after the cessation of military hostilities. He assessed two groups of Israeli children: children who lived in an area that was frequently shelled by enemy troops, and children who lived in non-shelled areas, and found that children who were shelled manifested significantly greater degrees of bruxism, a psychophysiologic condition associated with tension and anxiety, and which was measured according to a defined index of tooth enamel attrition. Children exposed to shelling also reported higher anxiety levels when watching stressful films associated with terrorist attacks than did their non-shelled peers. These results were evinced, in spite of the fact that anxiety levels were similar in neutral or non-symbolic stressful situations. Overall, it is clear that children continued to demonstrate significant subjective and objective manifestations of anxiety as long as two years after the offset of stressful conditions.
Two years after the Buffalo Creek dam break, Newman (1976) investigated the fantasy-elicited responses of 224 children between the ages of 2 and 12. She found children continued to be overly dependent, to have fears about going to bed alone, to be hyperactive, to have phobias associated with water, to have severe sleep disturbances (e.g., nightmares, sleepwalking, crying, and nocturnal enuresis). Older children became hypervigilant, always attentive to possible signals of recurring disaster. Evidence of psychic numbness, apathy, withdrawal, and sluggishness were still in evidence among victims of the Buffalo Creek disaster two years later (Rangell, 1976).

Payton and Krocker-Tuskan (1988) found pathological levels of anxiety, fearfulness, behavior disorders, aggression, depression, and withdrawal among children aged 5 to 9, up to five and a half years after the traumatic (violent) loss of a parent. In a sample of children held hostage in a school in the Netherlands, van der Ploeg (1983) found that more than one-third of the children developed phobias, 32% showed insomnia, and 41% evidenced marked tension.

Handford, Mayes, Mattison, Humphrey, Bagnato, Bixler, and Kales (1986) reported some findings which appear to contradict those of other studies of the long-term effects of a nuclear disaster on children. In a sample of 35 children ages 6 to 19 years, Handford found only moderate residual levels of anxiety and no evidence of abnormally high levels of behavioral or emotional problems. The authors speculated that it was because of the "silent," non-concrete nature of the radioactivity hazard that determined the low levels of psychopathology.

Other studies of PTSD in children. Deblinger, McLeer, Atkins, Ralphe, and Foa (1989) compared the rates of PTSD symptoms across sexually and physically abused, physically abused, and nonabused hospitalized children, ages 3 to 13. Overall, 20.7% of the sexually abused children appeared to meet the diagnostic criteria for PTSD. Group comparisons were made on the number of symptoms in each of the three PTSD categories, re-experiencing or repetitive phenomena, avoidant behaviors, and symptoms of autonomic hyperarousal. Sexually abused children evidenced more re-experiencing PTSD symptoms than did either physically abused or nonabused children. Both sexually abused and physically abused children showed tendencies to exhibit more symptoms in the avoidance/dissociative sub-category of PTSD than did nonabused patients. The sexually and physically abused children exhibited significantly more hyperarousal symptoms than the physically abused children. This finding
suggests that children who are exposed to multiple sources of trauma are more likely to evoke increased arousal symptoms.

**Prevalence of PTSD morbidity.** According to Pynoos and Nader (1988), the prevalence of psychiatric morbidity following a major trauma can range as high as 20 to 75%, as found with the victims of the Buffalo Creek disaster (Gleser, Green, & Winget, 1981). No comparable prevalence data for children or adolescents have been collected after major disasters. After traumas, however, severely exposed children have been reported to exhibit high prevalence rates of post-traumatic stress symptomatology (see Kinzie et al., 1986; Pynoos et al., 1987).

There may also be gender differences in the levels of children's symptomatology to traumatic events. Some reports have suggested that boys show a greater symptomatic response to traumatic events than girls (Lyons, 1987). Other findings (Burke, Moccia, Borus, & Burns, 1986; Gleser et al., 1981; Green et al., 1991) report that latency-age and adolescent girls show more symptomatology than boys. Girls may be at higher risk for PTSD-specific symptoms, whereas boys may show other types of symptoms (Gleser et al., 1981). In the adult literature, females tend to report twice as many post-traumatic symptoms than do males (Rubonis & Bickman, 1991).

**Conclusions about the course and morbidity of PTSD in children and adolescents.** Contrary to the DSM-III concept of a delayed onset disorder, most of the evidence indicates that early responses predict later symptomatology (Pynoos & Nader, 1988). Similar to adult studies, recent studies of school-age and adolescent children have found no apparent delay in the onset of PTSD symptoms. Early onset of symptoms is strongly predictive of later expression (see McFarlane, 1987; Terr, 1983) (see Appendix A-5). Evidence of the persistence of considerable levels of PTSD and related symptoms in children and adolescents in response to a wide variety of disasters and traumas, suggests that the adolescent survivors of a traumatic bus crash were likely to experience PTSD symptomatology four years after the event.

**Assessment of Long-term Sequelae of Trauma**

**Cognitive and behavioral sequelae of trauma.** Davidson et al. (1990) conducted a longitudinal study of the psychological, behavioral, and psychophysiological sequelae of exposure to hazardous substances with a group of adult victims of chemical exposure, versus a group of adults exposed to radon gas, versus a control group of
non-exposed adults. They utilized a proofreading task to measure concentration, motivation, and/or tolerance for frustration. They found that subjects exposed to man-made hazards (i.e., chemicals), showed significantly poorer proofreading performance than those subjects exposed to natural radon gas or control subjects. These findings support the notion that exposure to certain traumatic events has long-term, stress-related consequences on cognitive and behavioral functioning.

Psychological sequelae of trauma. In addition to having experienced an extreme stressor in order to qualify for a DSM-III-R diagnosis of PTSD, an individual must experience repeated and intrusive nightmares, recurrent and unbidden waking recall, and/or flashback experiences during which the individual actually acts or feels as if the event is recurring (see Appendix A-2 for a list of symptoms related to intrusive experiences). The individual must also show evidence of reduced responsiveness or involvement with the external world (see Appendix A-3 for denial symptoms), and show a variety of symptoms of increased arousal (see Appendix A-4). According to Lyons (1987) and Brett, Spitzer, and Williams (1988), the re-experiencing phenomena are the hallmark symptoms of PTSD, the core symptom that differentiates PTSD from other anxiety or dissociative disorders. It is also held that the increased arousal symptoms are linked to the maintenance of re-experiencing phenomena (Baum, 1990).

Visual and motoric reliving experiences, nightmares, flashbacks, and reenactments are generally preceded by increased physiological arousal (Rainey, Aleem, Ortiz, Yaragani, Pohl, & Berchow, 1987). van der Kolk (1988) has hypothesized that memory tracts are chronically augmented following trauma. This change in memory tracts in the brain underlies intrusive symptomatology under conditions of subsequent stress (see Appendix A-5 for a list of biological alterations associated with PTSD). This consequence has been documented following a large variety of different traumas, including combat, rape, kidnapping, natural disasters, accidents, child abuse, etc. (van der Kolk, 1987). Initial fear and alarm reactions common for victims of many types of traumas include tremulousness, tachycardia, palpitations, and sometimes nausea and vomiting (Wilkinson & Vera, 1989) (see Appendix A-4). In the impact phase of a disaster (Tylhurst, 1951), it has been estimated that the majority of affected persons (75%) show some or all of these physiological responses. According to the neurophysiological model of PTSD, severe trauma is sufficient to induce long-lasting changes in the structure and function of the brain. The following section reviews some
studies which have investigated the long-term physiological consequences of trauma and their relation to other PTSD symptomatology.

Davidson et al. (1990) conducted a longitudinal study of the psychophysiological sequelae of exposure to hazardous substances with a group of adult victims of chemical exposure, versus a group of adults exposed to radon gas, versus a control group of non-exposed adults. They examined chronic stress across three modalities; psychological, behavioral, and biological. In particular, HR and blood pressure was used to evaluate cardiovascular arousal. They found that both physiological indicators were significantly elevated over time in the chemically-exposed group versus the radon gas and control groups, suggesting that man-made disasters were more likely to lead to long-term (chronic) physiologically-marked stress.

Davidson and Baum (1986) found that adult victims of the nuclear accident at Three Mile Island exhibited higher stress levels as indexed by higher blood pressure and other health concerns as much as three, six, and ten years after the accident, than did control subjects. In the fifth year following the accident, PTSD symptomatology was assessed. An association between symptoms of chronic stress (blood pressure, catecholamine levels, and health concerns) and PTSD symptoms was found.

Symptoms of release (Kolb, 1987) including startle reaction, increased HR, etc., have been described in terms of a conditioned emotional response. Consistent with behavioral conceptualizations of the development and maintenance of PTSD symptomatology, the sights and sounds of the traumatic event become CS's associated with the fear-producing event (UCS), and come to elicit CR's in the absence of the traumatic event. These CS's potentiate physiological reactions, including the startle response (Omitz & Pynoo, 1989). According to Kolb et al. (1984), the activation of the conditioned startle response requires meaningful visual and auditory stimuli associated with those experienced during the traumatic event.

However, in Ornitz and Pynoo's (1989) study of startle responses in children with PTSD, they found that replication of the actual traumatic stimuli was not necessary to detect impaired startle inhibition. Rather, an unassociated stimulus which did not have conditioned emotional components elicited increased startle responses in the subjects. From this finding, Ornitz and Pynoo (1989) inferred that the change in startle inhibitory mechanisms was due to "underlying long-lasting alteration in the brainstem circuits subserving startle modulation" (p. 869). The conclusions in this study have a great potential for evaluating the internal validity of the construct of
PTSD, especially as it applies to the psychophysiologic assessment of children, and, by extension, to adolescents.

Psychophysiologic Assessment

Physiologic phenomena associated with chronic PTSD have been assessed in adults, primarily combat veterans (e.g., Brende, 1982; Malloy et al., 1983). As noted earlier, the reliability of psychophysiologic indices of PTSD (i.e., HR, GSR, skin temperature, EMG, etc.) have been well established (Keane et al., 1987). The following section reviews some of the most important studies in the literature on the assessment of Vietnam veterans, detailing relevant aspects of the paradigms used to examine psychophysiologic responding. The subsequent section provides empirical support for the use of cognitive tasks as control stimuli in the assessment of psychophysiologic responding.

Psychophysiologic studies of Vietnam combat veterans. Blanchard, Kolb, Pammeyer, and Gerardi (1982), and Malloy et al. (1983) have demonstrated increased arousal in war veterans on a variety of psychophysiologic measures, including HR, skin resistance, EMG, finger temperature, and blood pressure. Malloy et al. (1983) compared PTSD patients' responses with non-PTSD patients and non-PTSD combat veterans. In a study that used a series of combat slides that increased in intensity, the authors found that PTSD positives showed substantially more behavioral avoidance of the material, greater HR and GSR reactivity, and greater symptomatology when compared to non-PTSD nonveterans. PTSD veterans showed significantly more behavioral avoidance and physiological arousal (HR, systolic blood pressure, and EMG) to combat sounds that increased in sound intensity. In this study and in a study by Blanchard et al. (1982) control stimuli were used. Blanchard et al. (1982) monitored the psychophysiologic responses of Vietnam combat veterans with PTSD while they engaged in a control task that required attention (mental arithmetic). In both studies, responding to combat stimuli was significantly greater than responding to control stressors.

Neither study found that PTSD veterans and non-PTSD veterans responded differentially to control stimuli. Foy et al. (1987) suggested that these findings indicate that emotional responding is not a generalized emotional response, but a response to specific stimuli associated with combat. However, this finding was not tested with non-combat veteran controls. Nevertheless, the physiological indicators were so much
greater in PTSD patients than in controls, blind raters were able to correctly classify them 95.5% of the time.

Gerardi, Blanchard, & Kolb (1989) assessed whether subjects could fake psychophysiological responses to combat cues. Both PTSD and well-adjusted combat veterans were used for the study. Although well-adjusted veterans could increase their psychophysiological arousal when instructed to do so, the PTSD veterans continued a pattern of arousal, i.e., they did not habituate to the trauma-related stimuli as rapidly as did the well-adjusted veterans. Thus, the added criterion of prolonged habituation of psychophysiological indices of arousal may indicate that psychophysiological assessment can be considered a true biological marker of PTSD (Keane et al., 1987).

Numerous studies demonstrate chronic physiological hyperarousal in response to sounds (Malloy et al., 1983; Kolb & Multipassi, 1982), symbols (Pitman, Orr, Laforgue, & DeJong, 1987), and visual stimuli (van der Kolk & Ducey, 1985; Fish-Murray, Koby, & van der Kolk, 1987) related to the trauma. Foy et al. (1987) observed that veterans with PTSD did not differ from veterans without PTSD on measures of responding to control stimuli, suggesting that differences between groups were not due to generally higher levels of arousal in the PTSD group, but to specific responses to combat-related stimuli. In contrast, van der Kolk (1988) reported that his clinical experience suggests that increased autonomic arousal is non-specific, and may be elicited by a large variety of stimuli.

It is evident from these findings and others (Gerardi et al., 1989; Pitman, Orr, Forgue, de Jong, & Claiborn, 1987; Pitman, van der Kolk, Orr, & Greenberg, 1990) that psychophysiological assessment is an accurate and specific diagnostic test for PTSD. The technique is sensitive and powerful, especially in response to trauma-related stimuli (Friedman, 1991). This study employed both control and trauma-related tasks among crash victims and matched (non-crash) controls in the assessment of HR reactivity. In addition, the differential rates of physiological habituation was compared between the groups.

Psychophysiological study of children. In the only systematic neurophysiologic study of hyperarousal phenomena involving children, Ornitz and Pynoos (1989) conducted a study of startle modulation by prestimulation in a sample of seven children ages 8 to 13 years who had been exposed to a life-threatening violent event 17 to 24 months prior to assessment. All the children were diagnosed with PTSD on the basis of data from self-report on the Child PTSD Reaction Index (Pynoos et al., 1987),

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parent report, and individual clinical interviews. Their responses were compared to
tohose of normal control subjects and to normative startle modulation data. The startle
responses were modulated by nonstartling acoustic prestimulation in order to study the
inhibitory and facilitatory modulation of startle reaction by brainstem mechanisms. The
children with PTSD experienced a significant loss of the normal inhibitory modulation
of startle response. These findings suggest that the traumatic experience suffered by
the children had induced a long-lasting brainstem dysfunction, supporting the notion
that trauma induces long-lasting changes in the arousal mechanisms of the brain.

In an overview of the field of childhood stress, Anthony (1986) addressed a
number of theoretical and research issues associated with children’s reactions to severe
stress. He emphasized the need to integrate physiological and psychological responses
to stressful stimuli in attempts to understand children’s responses to overwhelming
stress. In addition, he noted the need to utilize "more objective measures" and
"dependable tests of internal stress" (p. 304), such as psychophysiological assessment
in the study of childhood stress responses.

Beidel (1991) has emphasized that, until recently, there has been little empirical
study of the psychopathology of childhood anxiety states. One reason may be that,
historically, childhood anxieties have been considered age-and stage-specific, transitory,
and without long-term detrimental effects. However, not all childhood anxiety states
are temporary, and some such as PTSD, may cause significant interference with
psychosocial functioning (see Terr, 1983). Not until the publication of DSM-III-R
(APA, 1987) were children’s responses to traumatic events included in the diagnostic
criteria for PTSD. There remain salient differences which may reflect fundamental
neuropsychological or physiological dissimilarities among adults, adolescents, and
children which need yet to be defined, particularly in the area of PTSD (Estè, 1985). It
is evident that little is known about children’s post-traumatic stress reactions at this
point in time, particularly long-term psychophysiological effects.

**Behavioral stressors.** Recent studies have examined behavioral and cognitive
predictors of cardiac reactivity. The following review of psychophysiological literature
focuses on specific effects of behavioral stressors on cardiovascular functioning in an
attempt to identify some behavioral stressors which elicit cardiac reactivity. Recent
research has examined the effects of cognitive variables on cardiovascular functioning
and the effects of physiological arousal on cognitive functioning, as well.
Several types of behavioral and cognitive stressors have been found to elicit cardiovascular responses (e.g., systolic and diastolic blood pressure, HR, finger pulse volume, pulse pressure, and ECG T-waves). Behavioral stressors used in experimental studies have included: the cold pressor task, isometric exercise, reaction time (shock avoidance task), loud noise, and isotonic exercise. Cognitive and psychomotor stressors have included: competitive video games, mirror tracing, serial subtraction, social-evaluative threat, reverse digit recall, mental arithmetic, Raven’s matrices, anagrams, anticipation and interview periods, among others. Physiological research has also tended to examine only acute effects of stressors on cardiovascular functioning while ignoring chronic effects of stressors, such as severe trauma.

Behavioral stressors often evoke responses of the autonomic nervous system, which regulates basic physiological processes such as HR and GSR. The stability of cardiac reactivity over long periods of time has been demonstrated in two studies by Matthews et al. (1987) in which they examined the degree to which cardiovascular response (CVR) in children is stable across major developmental periods (i.e., from pre- to post-puberty) and between three types of behavioral stressors. In the first study, eighteen eighth grade females were tested twice, ten and half months apart. The dependent measures were blood pressure (BP) and HR, measured by an electrosphygmomanometer and electrocardiogram. After obtaining baseline measures, the students performed two tasks in counterbalanced order: a cognitive task (serial subtraction); a psychomotor task (mirror tracing); and lastly, an isometric exercise (squeezing a hand dynanometer). Results showed that mean task-induced increases in diastolic BP and HR were reliable across sessions.

Using the same apparatus and similar procedures, the second study (Matthews et al., 1987) examined changes in BP and HR responses in 18 fifth grade boys tested again in ninth grade. The relative magnitude of the boys’ HR and diastolic BP responses to a behavioral stressor was similar to the relative magnitude of responses made 41 months later on other behavioral tasks. The overall results suggest that task-induced DBP and HR responses of children are stable across developmental periods, and generalize across tasks requiring qualitatively different behavioral responses.

Another study by Carroll, Turner, and Hellawell (1986) demonstrated the effectiveness of two cognitive tasks in eliciting cardiac reactivity. Carroll et al. (1986) explored the effects of cognitive task difficulty on cardiac activity as indexed by HR. This study utilized a cognitive task, mental arithmetic (MA) to elicit increases in HR.
Seventy-two (72) MA problems were presented to a group of undergraduate students in three 4-minute blocks, constituting easy, hard, and impossible problems. The problems were delivered via a tape recorder for six seconds, followed two seconds later by an one-second answer. A one-second interval preceded the next problem, during which time, the subject judged the correctness of the previous answer.

HR reactions were more marked when the MA task was either hard or impossible. There was an overall decline in HR across each task period. For the MA task, HR change from baseline was significantly higher. Ventilatory data confirmed that these changes were not simply due to changes in energy expenditure. There was a highly significant effect for MA task in terms of correct answers per each task period. The results confirm that HR during an active psychological challenge is reactive to cognitive stress demands.

In summary, although various stressors may evoke somewhat different patterns of response, studies of response during challenging or stressful tasks all reveal general evidence of similar or consistent patterns of arousal (Baum, 1990). It is the gradations of these responses rather than whether or not they occur that are likely to be used to index general stress responses (Baum, 1990; Krantz & Manuck, 1984). Therefore, it seems important to evaluate the relative magnitude of victims' physiological stress reactions to various types of stressors.

Research Questions

The main questions arising from the review of the literature concern the reliability of instruments currently used in the assessment of PTSD. Psychophysiological assessment has been shown to be a reliable biological marker of the disorder in adults. This study addressed the question of the reliability of psychophysiological assessment in distinguishing between traumatized and nontraumatized adolescents. In addition, it addressed whether or not HR as a psychophysiological index of chronic stress correlates with existing measures of symptomatology (i.e., structured interviews, self-report instruments). Finally, the study examined the extent to which psychophysiological and psychological sequelae of the bus crash were still in evidence four years after the event.
Summary and Goals

In summary, the purpose of this study was to investigate the relationships among trauma, self-reported re-experiencing, psychic numbing, and increased arousal symptoms, and physiological reactivity. This study employed self-report instruments and behavioral assessment strategies, together with an index of increased arousal (HR reactivity). The main goal of this study, then, was to validate self-report of PTSD-related symptomatology with a reliable psychophysiological index of the effects of trauma. The question of psychophysiological validation of PTSD symptomatology in adolescents was of particular interest, considering the gap in knowledge about the utility of psychophysiological assessment in determining adolescents' responses to severe trauma.

Hypotheses

Self-report hypotheses: (1) Survivors were expected to meet significantly more diagnostic criteria for PTSD than control subjects. (2) Survivors were expected to report significantly more PTSD symptomatology and stress-related psychopathology (greater number of symptoms endorsed or higher intensity scores) as measured by the DICA-R, the IES, RI, BDI, ASI, FSS, STAI, and AFC.

Behavioral hypothesis. Survivors were expected to make significantly more errors on the MA task than controls.

Physiological hypotheses. (1) Survivors were expected to evidence larger HR increases and a longer time to habituate HR in the MA situation than controls. (2) The survivor group was expected to evidence a HR increase that would remain constant across the time of the MA task and through the second baseline phase, whereas the control group would show a decrease in HR during the MA task and returning to baseline level by the second baseline period. (3) In response to the questionnaire situation, it was expected that survivors would evidence greater HR change compared to the MA situation. (4) Finally, HR levels at the end of the trauma-related interview were expected to be correlated with the number of DICA-R PTSD symptoms, and RI and IES intensity scores, particularly intrusion subscale scores.
Method

Subjects

The sample. The target subjects were 25 adolescents aged 16 to 20 who were survivors of a fatal bus crash that occurred in May, 1988. Of 67 passengers on the bus, 39 survived the head-on collision and resulting fire; 27 passengers died. All but four passengers high school or junior high school adolescents who were returning from a day-long outing to a large theme park. The outing was sponsored by a church in Radcliff, Kentucky. On the return trip, a pick-up truck, driven by an intoxicated adult male, entered the four-lane highway headed in the wrong direction. Traveling at a high rate of speed, the pick-up collided with the bus head-on. The bus burst into flames and many adolescents began to evacuate the bus. Most attempted to leave through the rear emergency door, while some evacuated through windows. Smoke and flames overcame many of the younger African-American female passengers seated in the forward benches.

Subjects were drawn from two groups; (1) survivors of the crash, and (2) control subjects matched closely for age, sex, race, and socioeconomic status (SES; as defined by the Four Factor Index of Social Status; Hollingshead, 1975). An art therapist hired by the Hardin County, Kentucky school system to help the students deal with the impact of the crash aided in recruiting survivors. Linda Probus, M. A. Expressive Therapies, A.T. R., provided both group and individual support to survivors and other students for two years following the crash. During her tenure with the school system, Ms. Probus developed contacts with the survivors and their families, other Hardin County students, the school board, the Kentucky Attorney General’s office, and a variety of health care providers in the community. She maintained contact with survivors in the intervening months, and assisted in recruiting survivors for this study. In April, 1991, Ms. Probus contacted 34 of the 39 crash survivors, and found that approximately 25 individuals would be willing to participate in a study related to the crash.

Consent and assent procedures. Parents of subjects who were minors (under 18 years old) were contacted first to inform them of the nature of the study and to obtain initial verbal consent for their child to participate in the study. Written, informed consent from parents and written, informed assent from minors was obtained before the interview. Parents of appropriate control subjects were contacted to obtain
initial verbal consent and to schedule an interview/testing time. Consenting and assenting survivors and control subjects were given two copies of each of the informed consent/assent forms to read and sign before the interview/testing period. Parents and children were given one of the two signed consent forms for their personal records.

Survivors. Survivors were scheduled for interviews to begin the first week of January, 1992. Reminder phone calls to subjects who had scheduled interviews were made the week before the interviews. Reminder calls were made again the day before the interviews. At that point, six survivors decided that they preferred not to participate in the study. In a period of three days, ten survivors were interviewed. Seven subjects chose not to come to the interview. When contacted, these individuals indicated that they had "forgotten" or had decided not to participate. These individuals were not pursued any further due to concern about going beyond the limits of courtesy and respect for their privacy. Another survivor who planned to participate, called from another state to say that she would not be back in time for her interview. In March, an eleventh survivor was interviewed in his home in Chapel Hill, North Carolina. In all, eleven survivors participated in the study.

Control subjects. Interviews of control subjects took place at the end of March and the middle of April, 1992. Those control subjects who were included in the study met several inclusionary criteria (see Appendix B). First, they had to be residents of Hardin County when the accident occurred. Potential control subjects were excluded from the study if they were related to or a close friend of a crash victim (either surviving or deceased), or had experienced a serious trauma, such as a car accident or near-fatal injury. Control subjects were matched closely on several demographic variables. They were matched for age, sex, race, and SES with the survivors. In addition, attempts were made to match the two groups on other demographic characteristics, including religious orientation, denominational preference, family living situation, academic performance, insurance coverage, etc.

Control subjects were recruited by a variety of means. Five control subjects were recruited with the aid of newspaper advertisements placed in the local newspaper (The News Enterprise) and friends recruited by those who responded to the ads. In addition, fliers were placed in the lobby of the Communicare Professional Counseling and Treatment Services office, detailing the need for subjects meeting specific criteria. Also, word of mouth in local high schools and local churches aided in recruiting three additional control subjects. Three African-American control subjects responded to
fliers distributed in the local mall and grocery store. The fourth African-American control subject was identified from the 1988 North Hardin High School yearbook. Control subjects recruited through the newspaper were offered a $20 incentive for participating, with additional monetary incentives for recruiting appropriate participants. Subjects recruited by telephone or by individual contact at the mall or at the grocery store were offered $30 for participating.

Some control subjects were "over-sampled." This means, that, for some survivors, more than one control subject met the matching criteria. This strategy ensured that an adequate number of controls would appear for their interviews and allowed for the possibility that unforeseen complications with data collection or in individual characteristics would require excluding some. In all, fourteen matched controls were assessed, but two were excluded from analyses. One control subject who was a year younger than the matched survivor was replaced by a control subject who was the same age as the survivor. A second control subject was excluded after disclosing that she was a close, personal friend of many survivors and victims of the bus crash. Thus, only twelve control subjects were included in the final analyses.

**Interview Procedures**

Interviews were conducted in the offices of Communicare Professional Counseling and Treatment Services, a community mental health center in the survivors' town of origin (Radcliff, Kentucky). Subjects completed individual interviews during 90-minute periods. To reduce interviewer bias, one of three graduate interviewers conducted interviews on a rotating basis. The interviewers trained to a criterion of 95% inter-rater reliability. Two interviewers were 35 and 33 year-old master's level graduate students who were in the experimental psychology program at Hollins College. The third interviewer was the primary investigator who was a doctoral candidate at Virginia Polytechnic Institute and State University. The primary investigator had conducted many diagnostic interviews in other research projects and had conducted training sessions for several other research assistants in the past.

Both graduate assistants trained in three separate sessions for a total of at least 11 hours. Training sessions consisted of becoming familiar with each measure, mock-interviews, extensive critique of mock-interviews, observations of the interview given at least once, detailed instructions about administration, testing over presented material, and reliability checks. Along with other training, each interviewer learned the DSM-
III-R diagnostic criteria for PTSD. At the end of training, inter-rater reliability among the three interviewers averaged .95.

During the assessments, one interviewer functioned as the primary interviewer, while another functioned as a reliability rater. Inter-rater reliability data were obtained on two-thirds of the sample. Inter-rater reliability coefficients were determined by subtracting the number of coding disagreements from the number of agreements, then dividing by the total number of diagnostic items, then multiplying by 100 to obtain a percentage of agreement. In this way, inter-rater reliability ranged between 88% and 100% agreement, with a mean agreement of 97.8%.

Since measures of simple percentage agreement may be inflated by chance agreement, Cohen's kappa coefficient was calculated between primary and reliability interviewers' coding (Frick & Semmel, 1978). Thus, kappa coefficients were determined to range from .88 to 1.0, with a mean kappa of .978, indicating a high degree of agreement between raters when controlling for chance agreement.

To enter the most reliable diagnostic data into the final data set, disagreements were resolved through discussion among the three interviewers. If doubt about the correct coding of a response remained, the portion of the interview in question was replayed on the tape player and the interview team reached a consensus concerning the coding of the response.

Psychophysiological Assessment Procedures

The primary researcher conducted all the psychophysiological assessments. Psychophysiological data were gathered with an Apple Ile biofeedback recorder, with HR reactivity (degree of change in HR, and time to habituate after a simple cognitive task) as the primary psychophysiological measures. HR was assessed according to the following schedule: 2-minute baseline, immediately followed by a five-minute cognitive task consisting of 72 arithmetic problems of moderate difficulty presented through a tape-recorder in 10-second intervals. Subjects judged correctly as many problems as possible. Another 2-minute baseline period ensued, followed by a questionnaire. A Bus Crash Questionnaire (BCQ) functioned both as a trauma-related stimulus to elicit HR changes, and to gather demographic data and information about traumatic life experiences, degree of exposure to the crash, and degree of loss. Subjects responded to the BCQ presented by way of a tape-recorder. HR was assessed during two six-minute phases of the BCQ, a demographic section and a traumatic event section.
Immediately following physiological assessment, a battery of self-report instruments was administered to assess subjects' post-trauma symptoms.

Materials

**Diagnostic Interview for Children and Adolescents-Revised** (DICA-R; Reich & Wetner, 1990). The DICA-R is a revised version of the Diagnostic Interview for Children and Adolescents (DICA; Herjanic & Reich, 1982), which is a structured psychiatric interview modeled after the adult Diagnostic Interview Schedule (DIS; Robbins et al., 1981). The DICA-R was designed to identify psychiatric symptoms and make psychiatric diagnoses in children and adolescents as specified by the DSM-III-R (American Psychiatric Association, 1987). The majority of the questions are answered "yes" or "no", with "yes" indicating a positive symptom. Test-retest reliability of the DICA-R ranges from 57% to 100%. The instrument includes demographic data, information concerning the subject's relationships at home, school, and with peers, school progress, social behavior, review of somatic symptoms, and questions covering a wide range of psychiatric symptoms (Herjanic & Reich, 1982).

The post-trauma adjustment of the subjects was assessed with the PTSD section of the DICA-R. The responses of control subjects were assessed as a basis for comparison. The bus crash served as the referent event for both groups. The PTSD interview was repeated for one to two additional events after the crash interview if subjects reported other potentially traumatic events. Behavioral observations were also be recorded according to the DICA-R protocol. The interview took approximately 10 minutes to administer.

**Reaction Index** (RI; Frederick, 1985). The RI is a 20-item questionnaire that can be administered either in an semi-structured interview format, or in a self-administered format. Patterned after DSM-III-R diagnostic criteria for PTSD, the items inquire about the subject's specific reactions to a traumatic event. Subjects rate each symptom on a 5-point scale (0 = none of the time; 1 = A little of the time; 2 = Some of the time; 3 = Much of the time; and 4 = Most of the time). Degree of severity may range from "Doubtful" (i.e., total score less than 12), to "Mild" (12 to 24 points), to "Moderate" (25 to 39 points), to "Severe" (40 to 59 points), to "Very Severe" (greater than 60 points). Frederick (1985) found a correlation of .91 between RI scores and status as an established case of PTSD. In this study, subjects responded
to the RI in a self-administered format. Again, for the purposes of this study, the bus crash served as the referent event for both survivors and control subjects.

Impact of Events Scale (IES; Horowitz et al., 1979). The IES is a 15-item, self-report questionnaire, designed to provide a cross-sectional picture of subjective psychological responses to stressful life events. The IES was derived from statements most frequently used by people to describe stressful events recently experienced (Horowitz et al., 1979). Through factor analysis, items were selected that were found to be common qualities or response sets in patients following stressful life events. The factor analysis identified two factors: 1) intrusive thoughts and affects; and 2) avoidance behaviors.

For the purposes of this study, the bus crash served as the referent for both survivors and control subjects. Subjects respond in terms of how frequently the statements were true within the past week. A four-point scale, ranging from "not at all" (scored 0), "rarely" (scored 1), "sometimes" (scored 3), and "often" (scored 5), indicates how frequently a symptom occurs. Horowitz et al. (1979) reported split-half reliability for the IES total scale as .86. Cronbach's alpha for the intrusion subscale was .78; for the avoidance subscale, .80.

Beck Depression Inventory (BDI). The BDI (Beck, Ward, Mendelsohn, Mock, & Erbaugh, 1961) is a 21-item self-report instrument designed to assess the intensity of depressive symptoms and attitudes. Subjects rate the items on an intensity scale that ranges from 0 to 3. Total scores between 0 and 10 are associated with no or minimal depression; between 11 and 17, mild to moderate depression; 18 to 24, moderate depression; and 30 to 63, severe depression. The coefficient alpha of the BDI is .87, and its test-retest reliability correlations are within the .80s.

State-Trait Anxiety Inventory (STAI). The STAI is a 40-item self-report questionnaire designed to measure both state and trait anxiety. State anxiety refers to temporary manifestations of anxiety that an individual experiences when exposed to some anxiety provoking stimulus. The State portion of the STAI contains 20 items. Respondents report their subjective anxiety at a particular moment by rating the items on a four-point scale ranging from "not at all" (scored 1), "somewhat" (scored 2), "moderately so" (scored 3), to "very much so" (scored 4).

Trait anxiety, on the other hand, refers to the relatively stable tendency to perceive and respond in an elevated fashion to environmental events that are considered minor in terms of arousing anxiety. The Trait scale consists of statements that ask
respondents to indicate how they generally feel by reporting how often they have experienced particular symptoms of anxiety on a four-point scale ranging from "almost never" (scored 1), "sometimes" (scored 2), "often" (scored 3), to "almost always" (scored 4).

Coefficient alphas for both STAI scales are .90 or higher for normative samples. Test-retest correlations for the trait-anxiety scale range from .73 to .86. Due to fluctuations in situational stress, test-retest reliability estimates for the state anxiety scale are lower.

**Fear Survey Schedule-II (FSS-II; Geer, 1965).** The 51-item FSS-II measures commonly occurring fears. The instrument lists potential fear-producing situations and stimuli. The subject rates his or her level of fear on a 7-point intensity scale ranging from "none" (scored 1), "very little fear" (scored 2), "a little fear" (scored 3), "some fear" (scored 4), "much fear" (scored 5), "very much fear" (scored 6), to "terror" (scored 7). Scores are the sum of item scores and range from 51 to 357. Total scores on the FSS-II reflect general fear. An additional item from the Fear of Fire Inventory (Jones & Randall, 1988) was included to assess subjects' fear of "fire; getting burned." Responses to this item were examined separately from the total FSS-II score.

The internal consistency of the FSS-II is very high, with a Kuder-Richardson 20 coefficient of .94. Concurrent validity is reported to be high (Corcoran & Fischer, 1987), with significant correlations with emotionality and anxiety. Known groups categorized according to FSS-II scores differed on five relevant criteria: (1) the time it took subjects to approach a frightening stimulus; (2) the distance between the subjects and the stimulus; (3) subjects' ratings of experienced fear; (4) experimenters' rating of subjects' fear; and (5) an affect adjective checklist completed by subjects.

**Anxiety Sensitivity Index (ASI; Peterson & Reiss, 1987).** The ASI consists of 16 items specifying possible negative consequences to the experience of anxiety. These consequences include additional anxiety or fear, illness, embarrassment and loss of control (Reiss, Peterson, Gursky, & McNally, 1986). Subjects rate each item on a 5-point scale indicating the intensity with which they experience the consequences of anxiety. Items are scored from "very little" (scored 0), "a little" (scored 1), "some" (scored 2), "much" (scored 3), to "very much" (scored 4). The anxiety sensitivity score is the sum of the scores on all 16 items. The scale can be administered in
individual or group testing situations. Test-retest reliability ranges between .71 and .75, indicating adequate test-retest reliability.

**Anxiety Frequency Checklist** (AFC; Reiss, Peterson, Gursky, & McNally, 1986; see also Silverman, Fleisig, Rabian, & Peterson, 1991). Reiss et al. (1986) constructed the AFC for use in a study to validate the distinction between anxiety sensitivity as measured by the ASI, and anxiety as measured by the AFC and the Taylor Manifest Anxiety Scale (TMAS; Taylor, 1953). Symptoms included in the AFC were rapid (pounding) heart beat, trembling, nervousness, feeling faint, nausea, shortness of breath, unusual body sensation, inability to keep mind on task, and diarrhea. Subjects indicate how often they experience each symptom on a 3-point scale ranging from "seldom" (scored 0), "sometimes" (scored 1), to "often" (scored 3). A fourth response, "don't know," is scored 0. Test-retest reliability is reported to be .77.

**Bus Crash Questionnaire** (BCQ; Ribbe, 1991a). The BCQ was derived from the Fire Questionnaire developed by Jones and Ribbe (1990) for use in assessing the psychosocial impact of residential fires on fire victims. The test-retest reliability of the FQ was found to be .87. Crash survivors and control subjects responded to the BCQ, which the primary investigator administered in an interview format during HR recording. The wording of the BCQ was modified to be appropriate for administering to control subjects so that the referent was "when you heard about the bus wreck." The BCQ is divided into two major sections; the first is focused on gathering demographic data, and previous and subsequent illnesses and traumatic experiences; the second is focused on assessing the degree of exposure to the traumatic event, obtaining a sequential report of the events of the crash, assessing the degree of objective and subjective loss, etc.

**Tasks**

**Trauma-neutral task.** Psychophysiological data were gathered with two Biofeedback MicroLab monitors and recorders driven by two Apple IIe computers with HRM software. HR reactivity (HR change in beats per minute, time to habituate to the cognitive task described below) was the primary psychophysiological measure. An attempt was made to record galvanic skin response (GSR) as another physiological measure. Due to recording and computer programming difficulties, however, reliable GSR measures were obtained on only one half of the sample (primarily control subjects). Therefore, statistical analyses did not include GSR.
A five-minute adaptation period preceded the gathering of psychophysiological data. Then, baseline HR data were collected for two (2) minutes before the cognitive task, with HR being averaged across 10-second intervals and then averaged every minute (see Armstrong, Collins, Greene, & Panzironi, 1988; and Beidel, 1988). The cognitive task followed the baseline period immediately, with HR being averaged across 10-second intervals and then averaged every minute for five (5) minutes. After each recording period, the average of the entire period was computed and used in the statistical analysis.

The cognitive task consisted of arithmetic problems of moderate difficulty as described by Carroll et al. (1986). The cognitive task (hereafter referred to as mental arithmetic or MA), comprised pre-recorded problems and answers presented to subjects by a tape-player. Each problem trial consisted of a problem, presented in six (6) seconds. Two (2) seconds later, a one (1) second answer followed. A one (1) second interval followed the answer, during which subjects indicated verbally the correctness of the answer by stating "right" or "wrong". The next problem trial followed the previous trial immediately. Problems involved the addition and subtraction of two- and three-digit numbers. The ratio of addition to subtraction problems was 1:2 (see Appendix C for the list of problems). Subjects were instructed to judge correctly as many problems as possible within the five-minute period. The number of correctly answered problems was recorded as a dependent variable. A return-to-baseline period lasting one minute followed the MA task. It preceded the demographic portion of the BCQ interview, during which HR was averaged across 10-second intervals and then averaged for the entire minute.

**Trauma-related interview.** Subjects then responded to the crash section of the BCQ presented through the tape player. This portion of the interview immediately followed the demographic section. Control subjects responded to some BCQ questions concerning when they heard about the bus wreck. HR was averaged across 10-second intervals and then every minute during the two BCQ sections.

All data collection took place at Communicare Professional Counseling and Treatment Services, a local mental health outpatient facility in Radcliff, Kentucky, with the assistance of the director, Dr. Thomas Bush, Psy.D. All physiological measurement was done in a specific room with minimal noise, lights, and distractions.

Before each individual interview/testing session, subjects (and their parents) were given the opportunity to ask questions about the content of the consent form, the
procedures, confidentiality, effects of participating, etc. Assessment began with
instruction about placing the HR pulse meter and GSR electrodes, and instruction about
the MA task. The order of assessment procedures went as follows:

- Introductions, explanation of the project, signing of consent forms, signing of
  project participation forms (15 minutes)
- Instructions and adaptation period (5 minutes)
- Psychophysiological assessment during baseline and cognitive task (7 minutes)
- Psychophysiological assessment during return-to-baseline, BCQ demographic
  interview, BCQ crash interview, and return to baseline period (17 minutes)
- Rest (5 minutes)
- Self-report assessment battery (40 minutes)

The entire assessment took between 75 and 120 minutes to complete, with a
modal time of 90 minutes. A break followed the psychophysiological assessment.

Debriefing Procedures

Following the psychophysiological assessment and self-report battery, subjects
were encouraged to direct any questions relating to the project to the principal
investigator, the Human Subjects Committee Chair, the Chair of the Institutional
Review Board, the project supervisor, or the project facilitator. They were given the
name, address, and phone number for each of the above. The names, addresses, and
phone numbers of contact persons at the Radcliff Communicare were provided to each
subject, should he or she request additional help dealing with issues related to the
wreck. Each participant received a hand guide for people who deal with the death of
school children published by MADD (Mothers Against Driving Drunk) entitled "Death
in the Schools." The guide was written by Janice Lord, National Director of Victim
Services, MADD, with assistance from Robert Pynoos and Kathi Nader, Directors of
the UCLA Prevention Intervention Program in Trauma, Violence, and Sudden
Bereavement, and Linda Probus. The guide included the specific example of the
Radcliff bus crash. Finally, subjects received a brief letter describing the basic findings
of the study.

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Results

The following results are conceptually organized in five sections: (1) data descriptive of the sample; (2) self-report data (DICA-R, RI, IES, BDI, STAI, FSS, ASI, AFC); (3) behavioral data (MA problems); (4) psychophysiological data (HR); and (5) inter-correlations between dependent measures.

Descriptive Data

Twenty-three subjects participated in the study; 11 survivors and 12 controls. In all, the demographic characteristics of the two groups were quite similar. Table 1 summarizes the demographic variables on which the samples were matched most closely. The survivor group comprised six females and five males; the control group, seven females and five males. Three subjects in each group were African-American, whereas the remainder of both groups was white. Five (45%) of the survivors stated their denominational preference to be Baptist; four (36%) attended Assemblies of God; and 9% each, Catholic and "Protestant." Fifty-eight percent (58%) of the control group were Baptist; 17%, Catholic; and 8% each, Assemblies of God, Methodist, and Mormon. The socio-economic status (SES) of the survivor group ranged from 23 to 62 on the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975), with a mean SES score of 44 (SD = 10.56). The SES of the control group was comparable, ranging from 27 to 56, with a mean SES score of 47 (SD = 7.84). The mean SES scores of the two groups did not differ significantly, t (21) = -0.82, p > .10. Subjects in the survivor group had completed between 10 and 12.5 years of education, with a mean of 11.7 years. Controls had completed between 10 and 12 years of education, with a mean of 11.0 years.

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Insert Table 1 about here
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Age comparisons. Age effects were explored in order to determine whether this variable should be included in the design. Subjects ranged in age from 16 to 20 years of age, with a mean age of 17.7 and a modal age of 17. The mean age of the survivor group was 18.1 (SD = 1.4); of the control group, 17.4 (SD = 1.4). An independent t-test revealed that the mean ages of the two groups were not significantly different, t (21) = 1.17, p = .25.
To examine further the possibility of systematic age effects, subjects were divided into two groups, those 16 and 17 (n=13), and those 18 to 20 (n=10). Then, as appropriate, univariate or multivariate analyses of variance (ANOVAs or MANOVAs) were performed on each dependent variable, with age grouping as the independent variable. No age effects were found for past or current DICA-R symptoms, past or current DICA-R criteria, RI, IES, BDI, STAI, FSS, ASI, AFC, or MA. In addition, a correlation matrix of all the dependent measures with age as a continuous variable yielded no significant correlations. In light of the negative findings for age effects, age was not included in the statistical design.

**PTSD diagnosis.** Based on survivors' self-report on the DICA-R, 55% (n = 6) met the full DSM-III-R criteria for past PTSD in the months following the bus wreck. Of the six survivors with PTSD, three were males; three, females. One was 16 years old, two were 17 years old, and three were 19 years old. Although 45% of the survivors did not meet the full diagnostic criteria for past PTSD, all (100%) met at least one psychiatric criterion of PTSD and 82% met two of the three psychiatric criteria. The survivors reported the presence of a high number of past PTSD symptoms related to the wreck (M = 9.2, SD = 4.1). Table 2 summarizes the percentage of survivors and controls who endorsed individual PTSD symptoms as being present in the months following the wreck (past incidence). Survivors also endorsed a moderate number of current PTSD symptoms (M = 4.1, SD = 2.5). Only one survivor, a 16 year-old female, met the full diagnostic criteria for current PTSD related to the wreck. Table 3 shows the percentage of survivors and controls who endorsed current wreck-related PTSD symptoms.

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Insert Tables 2 & 3 about here

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The intrusion symptom most frequently reported by survivors was thinking about the wreck a lot (91%); the most frequently reported avoidance symptom was amnesia for details of the wreck (82%); and the most frequently reported increased arousal symptom was increased autonomic reactivity when reminders of the wreck were encountered (82%). The least frequently reported symptoms were both in the avoidance category; loss of caring feelings and changed outlook on future (both 9%).
All survivors reported that they had experienced at least one previous stressful event such as a fire, flood, earthquake, storm, car accident, or witnessing injury to another person. The previous experiences of three survivors were judged to be of sufficient severity to meet DSM-III-R Criterion A (e.g., "an event outside the range of usual human experience that would be markedly distressing to almost anyone"). Therefore, the three survivors were given the DICA-R PTSD interview relating to their previous trauma. One survivor reported six past PTSD symptoms (and three current symptoms) related to witnessing the shooting of another person. A second survivor reported three past PTSD symptoms (all three current symptoms) related to a car accident that resulted in a broken neck. The third survivor interviewed thus reported one past and no current PTSD symptoms related to witnessing the shooting of another person. All three survivors with severe previous stressors also had diagnosable past PTSD related to the wreck. A control subject reported eight past (one current) PTSD symptom related to witnessing his brother being hit by a motorcycle. This subject met the diagnostic criteria for previous PTSD.

Severity of PTSD symptomatology. Survivor's RI scores ranged from 3 to 60 ($M = 24.5$, $SD = 16.1$). According to Pynoos and Nader (1988), RI scores between 0 and 11 indicate "no trauma"; between 12 and 24, "mild trauma"; between 25 and 39, "moderate trauma"; and greater than 40, "severe trauma." Table 4 shows the percentage of survivors and controls who fall into each of these categories. The table also provides RI data from another sample of child and adolescent auto accident victims ($n = 50$) for comparison (from Keppel-Benson, 1992). Higher percentages of bus crash victims were classified in the moderate and severe trauma categories.

Frederick (1988) has provided different, more conservative cutoff points for the RI, with scores less than 15 indicating "doubtful"; between 15 and 29, "mild"; between 30 and 44, "moderate"; between 45 and 59, "severe;" and 60 or more, "very severe." Only one bus crash survivor was classified as "very severe," and no survivors were classified in the "severe trauma" category. Table 5 shows the percentage of survivors and controls who fit each of Frederick's categories.

Insert Tables 4 & 5 about here
Scores on the IES also showed variability among survivors, ranging from 0 to 45 (M = 14.8, SD = 13.0). These scores are compared to others reported by Yule & Williams (1990), Keppel-Benson (1992), Jones and Ribbe (1991a & b) in Table 6.

To examine further the degree of impact experienced by the survivors within the seven days preceding assessment, their scores are categorized by impact levels. Horowitz (1982) suggested cutoff scores for determining low, medium, and high symptom levels using the total scores (less than 8.5 = low; 8.6 to 18.9 = medium; 19.0 and above = high). According to these severity categories, three survivors fell into the "low" impact category; five, into the "medium" category; and three, into the "high" category. Three survivors with past PTSD as determined by the diagnostic interview were classified in the "high" category, while two fit the "medium" category, and one fit the "low" category. Their scores ranged from 4 to 45 (the maximum possible score is 65), with a mean of 20.2.

Self-Report Data

Analyses focused on between-group and gender comparisons of overall levels of PTSD and stress-related symptomatology (as measured by the DICA-R, RI, IES, BDI, STAI, FSS, ASI, and AFC). In cases where a measure was comprised of more than one subscale, multivariate analyses of variance were used, with the subscale scores as the dependent variables. In light of the small sample size and the effects that it may have on MANOVA procedures, however, univariate results are also reported for each measure. Bonferroni corrections were applied to control for an inflated Type I error rate, due to multiple tests of significance performed on the data. This was done by multiplying the p-level of each main effect and each interaction by the number of univariate tests of significance performed on each set of dependent measures. For example, if univariate tests were conducted on three subscale scores and a total score of a measure, then the resulting significance levels were multiplied by four (the number of univariate tests performed). Thus, only those effects and interactions with p-levels equal to or less than .05 after the correction were reported as significant.

DICA-R. In order to examine the incidence of past PTSD in the study sample, a two-way factorial MANOVA was performed with group and gender as the
independent variables, and the number of past intrusion symptoms, the number of past avoidance symptoms, and the number of past increased arousal symptoms (i.e., B, C, & D criteria; see Table 1) as the dependent variables. There was a significant effect for group, $F (3,17) = 6.13, p < .01$, a significant effect for gender, $F (3,17) = 4.38, p = .02$, and a significant interaction, $F (3,17) = 5.22, p = .01$.

Two-way factorial ANOVAs were conducted on each dependent measure, with group and gender as the independent variables. For the number of intrusion symptoms reported, the effect for group was significant, $F (1,19) = 16.45, p < .01$, but neither the gender effect, $F (1,19) = 0.00, p = .99$ nor the interaction, $F (1,19) = 0.05, p = .82$ was significant. Likewise, for the number of avoidance symptoms reported, the effect for group was significant, $F (1,19) = 10.03, p < .01$, but neither the gender effect, $F (1,19) = 1.29, p = .27$, nor the interaction, $F (1,19) = 0.24, p = .63$ was significant. Finally, for the number of arousal symptoms reported, the effect for group was significant, $F (1,19) = 7.42, p = .01$, but neither the gender effect, $F (1,19) = 1.30, p = .27$, nor the interaction, $F (1,19) = 2.87, p = .11$ was significant.

A two-way factorial ANOVA was conducted with group and gender as the independent variables, and the total number of past B, C, and D PTSD symptoms reported as the dependent variable. The effect for group was significant, $F (1,19) = 11.87, p < .01$, but neither the gender effect, $F (1,19) = 0.00, p = .99$, nor the interaction, $F (1,19) = 0.18, p = .68$ was significant.

With the Bonferroni correction, the effect for group was significant at the $p = .04$ level for intrusion, avoidance, arousal and total symptoms. Table 7 summarizes the means and standard deviations of the number of DICA-R past bus-related intrusion, avoidance, arousal, and total PTSD symptoms reported by group and gender.

Insert Table 7 about here

In order to examine group and gender differences in terms of current PTSD symptomatology, a two-way factorial MANOVA was performed with group and gender as the independent variables, and the number of current intrusion symptoms, the number of current avoidance symptoms, and the number of current increased arousal symptoms as the dependent variables. There was a significant effect for group,
\[ F(3,17) = 8.82, p < .01, \text{ but neither the effect for gender, } F(3,17) = 2.98, p = .06, \text{ nor the interaction, } F(3,17) = 2.37, p = .11 \text{ was significant.} \]

Two-way factorial ANOVAs were conducted on each dependent measure, with group and gender as the independent variables. For the number of current intrusion symptoms reported, the effect for group was significant, \( F(1,19) = 9.17, p < .01, \) but neither the gender effect, \( F(1,19) = 4.20, p = .051, \) nor the interaction, \( F(1,19) = 2.26, p = .15 \) was significant. Likewise, for the number of avoidance symptoms reported, the effect for group was significant, \( F(1,19) = 23.89, p < .01, \) but neither the gender effect, \( F(1,19) = 0.33, p = .57, \) nor the interaction, \( F(1,19) = 0.13, p = .72 \) was significant. Finally, for the number of increased arousal symptoms reported, the effects for group and gender were significant, \( F(1,19) = 4.92, p = .04, \) and \( F(1,19) = 5.19, p = .03, \) respectively. The interaction was not significant, \( F(1,19) = 3.08, p = .10. \)

In addition, a two-way factorial ANOVA was conducted with group and gender as the independent variables, and the total number of B, C, and D PTSD symptoms experienced within the past month as the dependent variable. The effect for group was significant, \( F(1,19) = 20.20, p < .01, \) but neither the gender effect, \( F(1,19) = 3.87, p = .06, \) nor the interaction, \( F(1,19) = 1.24, p = .28 \) was significant.

With the Bonferroni correction, the effect for group was significant at the \( p = .04 \) level for current intrusion, avoidance, and total symptoms. The group and gender effects for avoidance symptoms were not significant after the Bonferroni correction. Table 8 summarizes the means and standard deviations of the number of current bus-related intrusion, avoidance, arousal, and total PTSD symptoms reported on the DICA-R by group and gender.

A two-way factorial ANOVA was conducted with group and gender as the independent variables, and the total number of past B, C, and D PTSD criteria met as the dependent variable. The effect for group was significant, \( F(1,19) = 9.46, p < .01, \) but neither the gender effect, \( F(1,19) = 0.21, p = .65, \) nor the interaction, \( F(1,19) = 1.37, p = .26 \) was significant. In addition, a two-way factorial ANOVA was conducted with group and gender as the independent variables, and the total
number of current B, C, and D PTSD criteria met as the dependent variable. The effect for group was significant, $F(1,19) = 17.80, p < .01$, but neither the gender effect, $F(1,19) = 1.32, p = .26$, nor the interaction, $F(1,19) = 0.41, p = .53$ was significant. Table 9 summarizes the means and standard deviations of the number of both past and current psychiatric PTSD criteria met.

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Insert Table 9 about here

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Finally, to examine changes in PTSD symptomatology across time, subjects’ past PTSD symptoms related to the wreck were compared to their current wreck-related PTSD symptoms. A two-way factorial MANOVA with group and gender as the independent factors and difference scores from time one to time two as the dependent variables. More specifically, the difference scores were the number of past DICA-R intrusion, avoidance, and increased arousal symptoms minus the number of current intrusion, avoidance, and increased arousal symptoms. There was a significant effect for group, $F(3,17) = 22.36, p < .01$, a significant effect for time, $F(3,17) = 15.52, p < .01$, and a significant effect for gender, $F(3,17) = 9.70, p < .01$. There was also a significant group by gender interaction, $F(3,17) = 9.59, p < .01$. The group by time interaction was not significant, $F(3,17) = 2.49, p = .095$. Neither the gender by time interaction, nor the group by gender by time interaction was significant, $F(3,17) = 2.36, p = .11, F(3,17) = 1.65, p = .22$, respectively.

Univariate ANOVAs of the DICA-R intrusion, avoidance, and increased arousal difference scores were also conducted. For the intrusion symptoms, there was a significant effect for group, $F(1,19) = 47.06, p < .01$; for time, $F(1,19) = 33.33, p < .01$; and for the group by time interaction, $F(1,19) = 7.80, p = .01$. No other interactions for the intrusion symptoms were significant. Similarly, for the avoidance symptoms, the effect for group and the effect for time were significant, $F(1,19) = 57.99, p < .01$, and $F(1,19) = 16.00, p < .01$. The group by time interaction, however, was not significant, $F(1,19) = 1.59, p = .22$. The gender by time interaction was "nearly significant" with $F(1,19) = 3.88, p = .06$. No other interactions for the avoidance symptoms were significant. For the increased arousal symptoms, the effect for group was significant, $F(1,19) = 22.77, p < .01$, as were
the effects for gender and time, $F(1,19) = 8.25$, $p = .01$, and $F(1,19) = 39.18$, $p < .01$, respectively. In addition, the group by gender interaction was significant, $F(1,19) = 10.08$, $p < .01$. No other interactions for the increased arousal symptoms were significant. Figure 1 shows the number of past and current intrusion, avoidance, arousal, and total DICA-R symptoms by group and gender.

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Insert Figure 1 about here

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Another two-way factorial ANOVA was performed with group and gender as the independent factors. The dependent measure was the difference score for total DICA-R symptoms from time one to time two. The effect for time was significant, $F(1,19) = 40.85$, $p < .01$, as was the time by group interaction, $F(1,19) = 4.84$, $p = .04$. Neither the time by gender nor the time by gender by group interaction was significant.

With the Bonferroni correction, the effect for group was significant at the $p \leq .04$ level for intrusion, avoidance, and arousal symptoms. The same was true for the time effect, with the addition of a significant group effect for total symptoms. The gender effect and the group by gender interaction was significant for the arousal symptoms only. After the correction, the group by time interaction was significant for intrusion symptoms only. Figure 1 illustrates total past and current DICA-R PTSD symptoms by group and gender (see Figure 1).

**Reaction Index.** A two-way factorial MANOVA was performed with group and gender as the independent variables, and the intrusion, avoidance, and arousal subscale scores separately as the dependent variables (C. J. Frederick, personal communication, June 9, 1992). Neither the effect for group, $F(3,17) = 1.59$, $p = .23$, the effect for gender, $F(3,17) = 0.64$, $p = .60$, nor the interaction, $F(3,17) = 0.26$, $p = .85$ was significant.

Univariate ANOVAs of the individual subscale scores, however, yielded significant results. For the intrusion items, the effect for group was "almost significant", $F(1,19) = 4.38$, $p = .0501$, whereas the effect for gender, $F(1,19) = 1.64$, $p = .22$, and the interaction, $F(1,19) = 0.50$, $p = .49$ were not significant. For the avoidance items, the effect for group was not significant, $F(1,19) = 3.90$, $p$
neither was the effect for gender, $F(1,19) = 0.26, p = .62$, nor the interaction, $F(1,19) = 0.01, p = .93$. For the arousal items, the effect for group was significant, $F(1,19) = 4.75, p = .04$, whereas the effect for gender, $F(1,19) = 0.44, p = .51$, and the interaction, $F(1,19) = 0.44, p = .51$ were not significant. In addition, a two-way factorial ANOVA was performed on the total RI score, using the model described above. The effect for group was significant, $F(1,19) = 5.07, p = .04$, but the effect for gender and the interaction were not significant, $F(1,19) = 0.65, p = .43$, and $F(1,19) = 0.12, p = .73$, respectively.

With the Bonferroni correction, the effect for group was not significant for any of the subscales or for the total score. Table 10 summarizes the means and standard deviations of the sum of the intrusion items, the sum of the avoidance items, and the sum of the arousal items by group and gender.

Insert Table 10 about here

**Impact of Event Scale.** A two-way factorial MANOVA was performed with group and gender as the independent variables, and the intrusion and avoidance subscale scores as the dependent variables. Neither the effect for group, $F(2,18) = 2.62, p = .10$, the effect for gender, $F(1,18) = 0.41, p = .67$, nor the interaction, $F(1,18) = 0.20, p = .82$ was significant.

Univariate ANOVAs were performed on the subscale scores separately. For the intrusion subscale, the effect for group was significant, $F(1,19) = 5.10, p = .04$. Neither the effect for gender, $F(1,19) = 0.25, p = .63$, nor the interaction, $F(1,19) = 0.10, p = .76$ was significant. The effect for group on the avoidance subscale, however, was not significant, $F(1,19) = 0.38, p = .54$. Neither the effect for gender, $F(1,19) = 0.17, p = .68$, nor the interaction, $F(1,19) = 0.11, p = .75$ was significant. In addition, a two-way factorial ANOVA was conducted with group and gender as the independent variables, and total IES score as the dependent variable. Again, neither the effect for group, $F(1,19) = 2.63, p = .12$, the effect for gender, $F(1,19) = 0.00, p = .98$, nor the interaction, $F(1,19) = 0.00, p = .98$ was significant.

With the Bonferroni correction, the effect for group was not significant for the intrusion subscale score. Table 11 summarizes the means and standard deviations of
the intrusion and avoidance subscale scores and total scores on the IES, group by gender.

Insert Table 11 about here

A two-way factorial MANOVA was performed with group and gender as the independent variables, and the number of endorsed intrusion and avoidance items as the dependent variables. Neither the effect for group, $F(2,18) = 2.94, p = .08$, the effect for gender, $F(2,18) = 0.17, p = .84$, nor the interaction, $F(2,18) = 0.20, p = .82$ was significant.

Univariate ANOVAs were performed on the number of endorsed intrusion and avoidance items separately. For the number of endorsed intrusion items, the effect for group was significant, $F(1,19) = 5.76, p = .03$. Neither the effect for gender, $F(1,19) = 0.14, p = .72$, nor the interaction, $F(1,19) = 0.04, p = .85$ was significant. The effect for group on the number of endorsed avoidance items, however, was not significant, $F(1,19) = 1.09, p = .31$. Neither the effect for gender, $F(1,19) = 0.01, p = .91$, nor the interaction, $F(1,19) = 0.12, p = .74$ was significant. In addition, a two-way factorial ANOVA was conducted with group and gender as the independent variables, and total number of endorsed IES items as the dependent variable. Again, neither the effect for group, $F(1,19) = 3.40, p = .08$, the effect for gender, $F(1,19) = 0.01, p = .91$, nor the interaction, $F(1,19) = 0.01, p = .92$ was significant.

With the Bonferroni correction, the effect for group was not significant for the number of endorsed intrusion items. Table 12 summarizes the means and standard deviations of the number of endorsed intrusion, avoidance, and total IES items by group and gender.

Insert Table 12 about here

State-Trait Anxiety Inventory. A two-way factorial MANOVA was performed with group and gender as the independent variables, and the state and the trait anxiety subscale scores as the dependent variables. Neither the effect for group, $F(2,18) =$
1.49, \( p = .25 \), the effect for gender, \( F (2,18) = 0.19, p = .83 \), nor the interaction, \( F (2,18) = 0.38, p = .69 \) was significant.

Two-way factorial ANOVAs were performed, with group and gender as the independent variables and the state or trait subscales scores, respectively, as the dependent variable. Again, neither a significant group effect was found for the state subscale scores, \( F (1,19) = 1.10, p = .31 \), nor a gender effect, \( F (1,19) = 0.13, p = .72 \), nor an interaction, \( F (1,19) = 0.78, p = .39 \). The same was true for the trait subscale scores, \( F (1,19) = 0.28, p = .60 \), \( F (1,19) = 0.40, p = .54 \), and \( F (1,19) = 0.41, p = .53 \), respectively. Table 13 summarizes the means and standard deviations of STAI scores by group and gender in relation to same-age norms.

Insert Table 13 about here

Beck Depression Inventory. A two-way factorial ANOVA was performed on BDI scores, with group and gender as the independent variables. Neither the effect for group, \( F (1,19) = 0.10, p = .75 \), the effect for gender, \( F (1,19) = 1.02, p = .33 \), nor the interaction, \( F (1,19) = 0.96, p = .34 \) was significant.

Fear Survey Schedule. A two-way factorial ANOVA was performed on FSS scores, with group and gender as the independent variables. The effect for gender was significant, \( F (1,5) = 10.27, p = .02 \). Neither the effect for group, \( F (1,5) = 2.88, p = .15 \), nor the interaction, \( F (1,5) = 2.66, p = .21 \) was significant.

Anxiety Sensitivity Index. A two-way factorial ANOVA was performed on ASI scores, with group and gender as the independent variables. Neither the effect for group, \( F (1,19) = 1.49, p = .24 \), the effect for gender, \( F (1,19) = 0.35, p = .56 \), nor the interaction, \( F (1,19) = 1.26, p = .27 \) was significant.

Anxiety Frequency Checklist. A two-way factorial ANOVA was performed on AFC scores, with group and gender as the independent variables. Neither the effect for group, \( F (1,19) = 0.21, p = .66 \), the effect for gender, \( F (1,19) = 1.21, p = .29 \), nor the interaction, \( F (1,19) = 1.34, p = .26 \) was significant. Table 14 shows the means and standard deviations of BDI, ASI, and AFC scores by group and gender.

Insert Table 14 about here
**Behavioral Data**

A one-way ANOVA was conducted on the total number of MA problems judged correctly by group. The effect for group was not significant, $F(1,21) = 1.72$, $p = .20$.

**Physiological Data**

Due to computer failure to print out and store HR data for two survivors, only nine survivors were included in the physiological analyses. Consequently, only the nine controls who were matched most closely with the survivors were included in the analyses.

Although an independent $t$-test confirmed that group differences in initial baseline HR were not significant, $t(12) = -0.68$, $p = .51$, it was determined that a repeated measures analysis of covariance (ANCOVA) would not be appropriate to examine group, gender, and interaction effects for HR because there were group differences in mean HR at the first baseline, (R. Schulman, personal communication, July 16, 1992). Although the differences in initial baseline HR were not significant, an appropriate change score model was adopted to examine these differences while controlling for initial baseline HR (Beidel, 1988; Carroll et al., 1986). Change scores were computed by subtracting individuals’ mean initial baseline HR from each successive mean HR period. This yielded change scores for five time periods: MA, first return to baseline, demographic interview, bus-crash interview, and second return to baseline.

Change scores were then submitted to a three-way factorial repeated measures ANOVA, with group, gender, and time as the independent variables. The effect for time was significant, $F(4,11) = 15.85$, $p < .01$, as was the time by group interaction, $F(4,11) = 4.06$, $p = .03$. The time by gender and the time by gender by group interactions were not significant. The overall effects for group and gender, and the group by gender interaction were not significant, although, notably, the group effect was "almost significant," $F(1,14) = 3.40$, $p = .086$. The mean change scores for the survivor group were consistently higher across all five periods.

Univariate analyses showed that the effect for group was significant for the first return-to-baseline change score, $F(1,14) = 5.33$, $p = .04$. Visual inspection of the relative change in HR from the MA period to the first return-to-baseline period revealed that the matched controls' HR decreased across those intervals more than did the survivors' when adjusting for initial baseline HR (see Figure 2).
In addition, a three-way factorial repeated measures ANOVA was conducted with HR as the dependent measure and group, gender, and period as the independent variables, with six observations per subject at: (1) first baseline; (2) MA; (3) second baseline; (4) demographic interview; (5) bus crash interview; and (6) third baseline. Repeated measures analyses of variance of contrast variables were performed to determine mean, group, gender, and group by gender differences in HR between successive time periods. The mean HR collapsed across group and gender differed significantly between each time period; baseline to MA, $F(1,14) = 21.56, p < .01$; MA to return-to-baseline, $F(1,14) = 34.98, p < .01$; return-to-baseline to demographic interview, $F(1,14) = 34.98, p = .01$; demographic interview to bus crash interview, $F(1,14) = 5.53, p = .03$; bus crash interview to return-to-baseline, $F(1,14) = 37.18, p < .01$, (see Figure 3).

The demographic interview to bus crash interview contrast yielded a significant effect for group, $F(1,14) = 18.55, p < .01$, and a significant effect for gender, $F(1,14) = 5.21, p = .04$. Survivors’ HR increased between the demographic interview and the bus crash interviews, while controls’ HR decreased in the same interval. The interaction was not significant. There were no significant effects for group or gender, or significant interactions for any other contrasts (see Figure 4).

The significant group difference in HR between the demographic interview and the bus crash interview was confirmed with univariate analyses of response scores. Response scores were calculated by subtracting real HR of the previous assessment period from the subsequent assessment period. Thus, five response scores were obtained: (1) MA minus initial baseline; (2) return-to-baseline minus MA; (3)
demographic interview minus return-to-baseline; (4) bus crash interview minus demographic interview; and (5) final return-to-baseline minus bus crash interview. The effects for group and gender were significant at the fourth interval, the difference between the demographic interview and the bus crash interview, \( F (1, 14) = 18.55, \ p < .01 \), and \( F (1, 14) = 5.21, \ p = .04 \) respectively. Figure 5 illustrates the response score changes across assessment periods by group. Figure 6 shows the response score changes by gender. Figure 7 divides HR response scores by group and gender.

Insert Figures 5, 6, and 7 about here

To further examine group and gender differences in physiological response to the experimental situation, the standard deviation of HR was calculated for each subject for each time period. The standard deviation functioned as an index of autonomic lability to the various tasks and interview periods (S. P. Orr, personal communication, July 31, 1992). The data were subjected to a three-way factorial repeated measures ANOVA, using the same model as that used with HR. No overall effects for time, group, or gender and no interactions were evinced. However, a three-way factorial univariate ANOVA yielded a significant group effect for the bus crash interview period, \( F (1,14) = 5.21, \ p = .03 \), with the mean HR standard deviation for the survivors (\( \bar{x} = 4.7 \) bpm) being significantly greater than that for the matched controls (\( \bar{x} = 3.3 \) bpm). Due to the exploratory nature of HR standard deviation as an index of autonomic lability, interpretation of these findings should be made cautiously. Figure 8 illustrates the mean standard deviation of HR across assessment periods by group.

Insert Figure 8 about here

To test the hypothesis that the survivor group would evidence a HR increase that would remain constant across the time of the MA task and through the second baseline phase, whereas the control group would show a decrease in HR during the MA task and return to baseline level by the second baseline period, the slope of the HR habituation curve was computed for each subject. This was done by means of a mathematical program on Cricket-Graph\(^\circ\) which determined the line of best fit across
the five HR data points obtained during the MA task. The y-intercept, slope, and R-value (measure of variance around the line) was computed for each subject. The slope was then entered into a one-way ANOVA with group as the independent variable and slope as the dependent variable. The effect for group was not significant, $F (1, 16) = 0.17, p = .69$, indicating no difference in the rate of habituation between survivors and controls. The mean slope of the MA habituation curve was -1.50 ($SD = 0.99$) for the survivor group; -1.31 ($SD = 1.06$), for the controls. Figure 9 shows the mean slopes for the MA period for survivors and controls.

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To test the hypothesis that survivors would evidence greater HR change to the crash portion of the BCQ compared to the MA situation than would controls, change scores were computed by subtracting mean MA HR from mean BCQ crash HR. These change scores were then analyzed for group differences by means of a one-way repeated measures ANOVA of contrast variables with group as the independent variable and change score as the dependent variable. The contrast between the MA period and the crash interview period showed that the effect for group was not significant, $F (1, 14) = 0.17, p = .69$, indicating that survivors did not evince a significantly greater HR increase to the crash interview compared to control subjects when controlling for MA HR.

Finally, the hypothesis that HR levels at the end of the crash interview are related to the number of DICA-R PTSD symptoms, and RI and IES intensity scores (particularly intrusion subscale scores) was tested. To do this, HR change scores (calculated by subtracting the mean HR of the first baseline from the mean HR of the bus crash interview) were correlated with DICA-R intrusion, avoidance, arousal and total symptoms, IES intrusion, avoidance, and total scores, and the RI intrusion, avoidance, arousal and total scores, using Pearson's $r$. This was done collapsed over group and gender, and by group and gender separately. No significant correlations were found, indicating that HR elicited by the crash interview was not significantly related to self-reported symptomatology.
Inter-correlations Among Dependent Measures

The relationships among dependent measures of the survivor group were evaluated by means of Pearson’s correlation coefficient ($r$). A Bonferroni correction was applied to control for an inflated Type I error rate, due to multiple tests of significance performed on the data. Table 15 summarizes the relationship among the three measures of current PTSD symptomatology: 1) current DICA-R symptoms; 2) Reaction Index; and 3) Impact of Events Scale. The measures were significantly correlated at a $p < .002$ level.

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Insert Table 15 about here
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Correlations among each of the stress-related measures and each of the measures of current PTSD are depicted in Table 16. Five measures were significantly correlated with DICA-R current PTSD symptoms, four were significantly correlated with Reaction Index scores, and one was significantly correlated with Impact of Event Scale scores. Tables 17 through 19 show the correlations among stress-related measures and the intrusion, avoidance, and arousal subscale scores of each of the PTSD measures (only intrusion and avoidance for the IES). For the DICA-R, only arousal symptoms were significantly correlated with other measures (BDI and ASI). For the Reaction Index, five measures correlated significantly with the intrusion subscale; four, with the arousal subscale; and none with the avoidance subscale. For the Impact of Events Scale, none of the other measures correlated significantly with either the intrusion or avoidance subscale scores. Based on the sign test, there was evidence of a positive trend in the relationship between the dependent measures.

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Insert Tables 16, 17, 18, and 19 about here
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Discussion

Both of the main hypotheses in this study (stress-related psychopathology and physiological reactivity) were partially confirmed. Although groups did not differ in mental arithmetic performance, interview data supported the hypothesis that survivors experienced a high degree of psychic trauma and evidenced high levels of past PTSD symptomatology. In addition, HR data indicated that the bus crash interview elicited significant HR changes among survivors compared to controls.

Consistent with other studies of the mental health consequences of vehicular accidents among child and adolescent survivors, results indicated a range of post-traumatic symptomatology (Keppel-Benson, 1992). In addition, trauma-related symptomatology was still in evidence among survivors four years post-trauma. While the sample size was quite small due to a high rate of canceled interviews and "no shows" among survivors, the results are similar to those found in the trauma and disaster literature (Green et al., 1991; Yule & Williams, 1990).

Measures of stress-related psychopathology varied in the degree to which they distinguished between survivors and matched controls or detected gender differences in symptom expression. In a meta-analysis of the relationship between disaster and psychopathology, Rubonis and Bickman (1991) found that studies that used questionnaires to assess disaster-related psychopathology reported significantly higher effect-size estimates than those that used interview methods. Interestingly, in this study, the most reliable findings of the relationship between the wreck and psychopathology were found with the diagnostic interview; questionnaire methods yielded comparable or even lower degrees of psychopathology. The diagnostic interview appeared to be the most sensitive to the mental health effects of the wreck on survivors. Survivors reported significantly more past and current PTSD symptoms and met significantly more past and current PTSD criteria on the DICA-R than did controls. The interpretation of these findings, followed by the implications of findings obtained with each instrument are spelled out below.

DICA-R PTSD

One of the primary questions addressed in this study concerned the development of post-traumatic stress disorder among adolescent survivors of the bus crash. A secondary question related to the course of PTSD symptoms among adolescent
survivors over a period of four years. Thus, in the diagnostic interview, both past and current PTSD symptoms were assessed. Past PTSD symptoms were considered to be those that were reported as present at some time within the months following and related to the bus wreck (Kulka, Schlenger, Fairbank, Jordan, Hough, Marmar, & Weiss, 1991). If an individual reported the presence of a particular symptom in the past, he or she was then asked whether or not the symptom had been present within the past month. If so, then the symptom was considered to be current. The following two sections discuss the findings and implications for both past and current symptomatology.

**Past PTSD.** When considering past, wreck-related intrusion, avoidance, and increased arousal symptoms of PTSD as assessed by the diagnostic interview, there was a significant group by gender interaction, indicating that, depending on group membership, the number of symptoms reported varied between males and females. From examining the data, it appears that male survivors reported more avoidance symptoms than did their female counterparts, whereas female survivors reported more increased arousal symptoms than male survivors. Male and female survivors reported similar numbers of intrusion symptoms, which was the same pattern for male and female controls, though substantially less than that reported by survivors. An observation of interest is that male survivors' symptom patterns differ from that of female survivors, and male and female controls. Whereas the other three groups reported higher numbers of increased arousal symptoms relative to intrusion and avoidance symptoms, male survivors reported fewer increased arousal symptoms and relatively more avoidance symptoms.

It is clear from the data that the survivor group reported significantly more past PTSD symptoms than did the matched control group. The survivors reported an average of 9.2 total PTSD symptoms compared to 3.2 reported by the controls. The finding for the controls is comparable to that reported by control subjects in other studies utilizing the DICA-R for assessing PTSD symptomatology following disaster (see Jones, Ribbe, & Cunningham, in press). The number of PTSD symptoms reported by survivors, however, is more than twice the average number reported by disaster victims in other studies (Earls et al., 1989; Green et al., 1991). It is likely that the two-fold increase in number of symptoms reported is directly related to the magnitude of the trauma and its consequences (Jones, Ribbe, & Cunningham, in press).
The bus wreck involved significant loss of life and personal injury (primarily burns) to many of the occupants.

Green (1990) identified eight generic experiences that may occur within different types of extreme events: 1) threat to one's life or bodily integrity; 2) severe physical harm or injury; 3) receipt of intentional injury/harm; 4) exposure to the grotesque; 5) violent/sudden loss of a loved one; 6) witnessing or learning of violence to a loved one; 7) learning of exposure to a noxious agent; and 8) causing death or severe harm to another. Such experiences have an empirical association with PTSD and other stress-related symptomatologies, and they each involve an encounter with death or present a severe threat to the bodily integrity of oneself or an important other person. As a group of experiences that define traumatic events, they describe the risk factors which best predict psychological reactions to trauma. Multiple or prolonged episodes of extreme events increase the likelihood of developing PTSD or other stress-related psychopathology (Green, 1990).

The survivors of the bus crash in this study experienced several predictor events in the course of the wreck and the ensuing period. First, there is no question that all of the survivors experienced threat to life and bodily integrity. All of them endured the collision, subsequent explosion of gasoline fumes, searing heat and choking smoke, and the panicked stampede to exit the bus through the rear exit door or through windows.

Second, some experienced severe harm in the form of major burns to their faces, hands and arms. Of note on this point, only two survivors that consented to be interviewed had experienced serious burns. Many of the burn victims declined to participate in the study when they were first contacted. Other burn victims consented initially, but then did not appear for their scheduled interview. The responses of the survivors with the more serious injuries suggests that they may have been among the more serious psychological casualties of the wreck. It may be that they experienced greater distress initially, and continued to suffer from high degrees of intrusive thoughts and affects, as well as avoidance of situations that reminded them of the wreck. Although it is merely speculation to assume that the burned survivors were continuing to experience clinical levels of distress, the fact that the more seriously injured survivors did not participate in the study suggests that they did not do so partly because of their desire to avoid an interview which might arouse distressing memories.
of the wreck. Such avoidance behavior (if that is what it is), is consistent with that of individuals with PTSD.

Third, survivors and their families may have come to perceive that they had been the recipients of intentional injury. According to Linda Probus, many survivors and their parents expressed opinions and feelings of anger toward the man who caused the wreck. The consensus among the victims was that the man was entirely responsible for his actions, despite the fact that he was extremely intoxicated. This attitude and perception intensified through the drawn-out process of the state trial and the numerous appeals and additional civil suits filed against Ford Motor Company (the maker of the bus), and as the parole of the defendant became imminent.

None of the survivors that were interviewed reported that they had experienced direct exposure to the fourth risk factor, exposure to the grotesque. However, they did report that they saw the bus in flames, knowing that friends and siblings (and in one case, a parent) were likely to be still inside. None of them reported seeing other severely injured survivors at the scene of the wreck, although almost every subject reported being upset whenever they saw other survivors with facial burns in public places such as at school or in the mall.

Fifth and sixth, all of the survivors lost a friend, sibling, or parent in the wreck. The loss was sudden and violent. As mentioned above, the survivors witnessed the burning bus knowing that some people were still inside. For some, they learned of the death (or survival) of friends and family hours after they had been evacuated from the scene.

In sum, the survivors of the wreck, whether they participated in the study or not, all experienced at least one predictor event, if not four or five events related to the wreck. The cumulative effect of exposure to such events increased the likelihood that they would manifest symptoms of PTSD and other stress-related symptomatologies. The high levels of past, wreck-related PTSD symptoms reported by the survivors reflect the severity and magnitude of the stressor event. A more detailed, case-study analysis of individual survivor's experiences and reactions is provided in Appendix F.

Rubonis and Bickman (1991) provide additional support for the relationship between the magnitude of a disaster and psychopathology. From a meta-analysis of disaster/psychopathology studies, they found that the number of human casualties resulting from a disaster strongly affects the relationship between the disaster and psychopathology. Higher death rates are associated with higher psychopathology
estimates. In fact, death rate had the strongest relationship to effect size relative to the other independent variables utilized in their analyses. Death rate also appears to be a powerful moderator of the relationship between disasters and ensuing psychological problems, perhaps because bereavement is added to other stressors following a community disaster. This finding is consistent with studies examining the relationship between post-disaster bereavement and psychopathology (e.g., Gleser, Green, & Winget, 1981; Green et al., 1991). This factor appears to be strongly linked to the number of PTSD and event-related symptoms reported by survivors compared to those reported by control subjects on several measures in this study.

Another disaster variable related to the expression of psychopathology is the perception of the disaster as man-made in origin. The definition of a man-made disaster requires that "... the major physical force to be directly or indirectly caused by human means" (Rubonis & Bickman, 1991, p. 396). Given that the bus wreck involved a drunk driver, the wreck could be classified as being man-made. Indeed, as reported above, many survivors and their families (as well as the larger community) perceived that the driver of the pick-up truck was fully responsible for the wreck and the ensuing deaths.

Survivors differed from controls on every symptom dimension of past PTSD; intrusion, avoidance, and increased arousal symptomatology. Fully 100% of survivors endorsed at least one intrusion symptom, the minimum number of intrusion symptoms required to meet the intrusion criterion. Almost 55% of the survivors endorsed at least three avoidance symptoms, the minimum number of symptoms required to meet the avoidance criterion. Eighty-two percent (82%) of the survivors endorsed at least two increased arousal symptoms, the minimum number of increased arousal symptoms required to meet the arousal criterion. These findings are comparable to other investigations of child and adolescent accident victims.

In fact, the percentage of bus crash survivors who endorsed intrusive symptoms was more than twice that found in car accident survivors by Keppel-Benson (1992). The most commonly reported intrusion symptom was intrusive recollections, a symptom reported by 90% of the survivors—three times the percentage reported car accident survivors. The most commonly reported avoidance symptom was amnesia for details of the wreck, a finding very similar to that reported for car accident survivors. In this study, however, 82% of the survivors endorsed this symptom, more than twice the percentage reported by car accident survivors. Many bus crash
survivors reported that they remembered the initial impact, the explosion of gasoline fumes, and the rush toward the back of the bus, but do not recall how they got out of the bus or how they got to the median of the highway. In terms of increased arousal symptoms, the greatest percentage of survivors (82%) reported increased autonomic reactivity to reminders of the wreck, compared to 6% of car accident survivors. This was the only PTSD criterion in which the bus crash survivors did not report the PTSD symptomatology in the same pattern as car accident survivors.

The symptom patterns of bus crash survivors in this investigation appear to be consistent with the pattern of individuals who have experienced a severe stressor. Lyons (1991) and Brett et al. (1988) have argued that intrusive symptomatology is the hallmark of the diagnosis of PTSD. As such, the high level of endorsement of intrusion symptoms among the survivors may reflect the intensity with which they experienced the bus crash. Lower rates of reporting avoidance and increased arousal symptoms may not be necessarily a negation of the severity of survivors’ response to the wreck, however. For example, Solomon and Canino (1990) noted that several studies were more specific about the types of symptoms reported by disaster victims. Most victims in the review reported primarily the intrusion kinds of symptoms. Other symptoms related to trauma, particularly avoidance symptoms, but also increased arousal symptoms, were reported much less frequently. This pattern of symptom reporting was found in this study, as well, as the highest percentage of survivors met the intrusion criterion, the next highest percentage met the increased arousal criterion, and the smallest percentage met the avoidance criterion.

Solomon and Canino (1990) offered two explanations for the apparent under-reporting of avoidance and increased arousal symptoms. The first was that the avoidance and increased arousal criteria may be really reflections of other disorders, such as depression or anxiety. The second explanation offered by Solomon and Canino was that the measures of avoidance and increased arousal symptoms are flawed, requiring the victim to make a link between the stressor and subsequent symptoms. While the connection between intrusion (or re-experiencing) symptoms and the precipitating trauma may be obvious to victims, the causal connection between symptoms such as "having no caring feelings for anyone anymore" and the trauma may not be as clear. Requiring victims to link avoidance and increased arousal symptoms to the stressor was found to be strongly related to under-reporting of symptoms in a PTSD interview. This is primarily an issue of assessment which may be resolved by
administering PTSD interviews with the link between the stressor and the symptoms made specific in the questions (Solomon & Canino, 1990). The implications of this assessment flaw may be that survivors in the current investigation under-reported important PTSD symptomatology, resulting in lower correlations between measures of PTSD and other measures of psychopathology.

The mental health consequences of the wreck may be particularly evident when placed into an empirical framework that includes PTSD prevalence rates from both epidemiological and related trauma research. Notably, the past prevalence for the DSM-III-R diagnosis of PTSD in relation to the bus wreck alone among survivors was 55%, compared to 8.8% to 14.7% reported by the Centers for Disease Control (CDC) epidemiological data from the general population (Kulka et al., 1991). The prevalence rates for wreck-related PTSD diagnoses among the survivors of the wreck compare to 30% lifetime PTSD diagnoses using the DICA-R among children ages 7 to 19 who had sustained burn injuries (see McNally, 1991). Among children ages 6 to 16 who had been involved in a motor vehicle accident, 14% met DSM-III-R criteria for PTSD an average of 9 months post-accident (Keppel-Benson, 1992).

**Current PTSD.** The current (past month) prevalence for the PTSD diagnosis related to the bus wreck was 9% four years post-disaster, compared to 1.5% to 2.2% percent reported by the Center for Disease Control (CDC; Kulka et al., 1991). Among children ages 7 to 19 who had sustained burn injuries, 6.7% met criteria for current PTSD (see McNally, 1991).

A disaster variable that has been associated with effect size is the amount of time elapsed since the disaster (Rubonis & Bickman, 1991). Greater time was found to be associated with lower effect-size estimates. This variable has particular relevance from a developmental perspective, given that survivors ranged from 12 to 16 years of age at the time of the wreck. Interestingly, there did appear to be a marked decrease in the number of psychiatric symptoms of PTSD among survivors of the wreck in the period of four years. Nevertheless, the level of self-reported symptomatology four years post-disaster among survivors was still significantly higher than that reported by the matched controls, indicating that the impact of the wreck was still detectable, even after the passing of so much time. IES scores compared across four other studies of young trauma victims appear to vary as functions of the amount of time elapsed since the trauma, and the severity of the consequences of the trauma (see Table 5).
'Though survivors had had time and opportunity to adjust to the impact of the wreck, various events following the wreck, such as anniversaries, dedication of the memorial park, news updates on the appeals of the jailed pick-up truck driver, and even the current research investigation serve as frequent reminders of the trauma. The cumulative effect of such reminders may serve to maintain various PTSD symptoms of re-experiencing, avoidance, and increased arousal in a manner consistent with the two-factor theory of PTSD.

A gender effect was almost evinced when examining current PTSD symptom patterns. It is apparent from the data that this was due primarily to larger decreases in male survivors' intrusion and arousal symptoms compared to female survivors. This "near significance" was also found for the total number of PTSD symptoms, with female survivors reporting nearly twice the number of current symptoms reported by male survivors—a figure which is consistent with other findings examining gender differences in current PTSD symptomatology in response to major disasters (Steinglass & Gerrity, 1990). A number of studies report that PTSD symptom rates for female-to-male comparisons is about 2:1 (Helzer, Robins, & McEvoy, 1987; Shore, Tatum, & Vollner, 1986; Steinglass & Gerrity, 1990). Rubonis and Bickman (1991) found that the greater the number of females in the sample under study, the higher the psychopathology effect-size estimate. It may be that gender as a victim characteristic accounts for a portion of the variance in the disaster-psychopathology relationship in the current investigation, as well. Although the sample size was too small to make generalizations of the importance of these findings related to gender, they do provide heuristics for future research.

PTSD Diagnosis. Despite the high percentage of survivors who met the diagnostic criteria for PTSD, some questions about the interpretation of the "diagnostic" findings in this study remain. A primary question pertains to the assumption that post-traumatic stress reactions are pathological. If this assumption is true, would not the survivors who met the criteria for past PTSD have responded in ways that were not expected? The evidence is that none of the participants had been diagnosed with any sort of psychiatric disorder following the crash. It is possible that the distressing reactions they experienced were normal and appropriate in view of the situation. Robins (1990) questioned whether the diagnosis of PTSD is to be made only if the reaction is excessive or if it lasts too long. For the participants in this study, the answer to that question may only be resolved by assessing the degree of impairment
experienced in various spheres of functioning over a long period of time. Until then, it may not be appropriate to assume that their reactions were anything but normal reactions to a stressful event.

**Self-Report Measures**

Self-report indices of post-traumatic symptomatology (i.e., the Reaction Index and the Impact of Events Scale) supported the diagnostic data, but not as strongly. Here, the intrusion and increased arousal symptomatology appeared to be more discriminating than avoidance symptomatology. On the whole, both the diagnostic interview and self-report measures yielded results that suggest that intrusion and increased arousal symptomatology distinguished between survivors and controls better than did measures of avoidance. These findings are consistent with the explanations offered by Solomon and Canino (1990; above), and with those obtained with the DICA-R in the current investigation. Of note, no gender differences or interactions were found on any of the psychometric measures of PTSD or stress-related symptomatology. This finding may be related to the nature of the instrumentation used, and, as such, is discussed in terms of research methodology below.

**Reaction Index.** In addition to the DICA-R, which is a structured diagnostic interview, PTSD was also assessed by means of the RI, which can be used as either a semi-structured interview or as a self-report paper-and-pencil questionnaire. According to Frederick (personal communication, June 10, 1992), the RI can be divided into three "subscales" reflecting the three symptom categories of PTSD, intrusion, avoidance, and increased arousal. Unlike the DICA-R, when the data were examined from a multivariate perspective, survivors and controls did not differ. However, when examined from a univariate perspective, the intrusion and increased arousal subscales discriminated significantly between survivors and controls; the avoidance subscale did not. In addition, the total RI score differentiated between survivors and controls. These findings suggest that the RI was not as sensitive a measure of PTSD symptomatology as the diagnostic interview. Several possible explanations for this conclusion are offered.

First, as a structured interview, the DICA-R allows for greater probing and clinical assessment of the presence or absence of symptomatology, perhaps making it a more sensitive instrument for diagnosing PTSD (Jones & Ribbe, 1991a). Secondly, the RI is administered in the context of how frequently the symptoms were experienced
within the past month, making it a measure of current psychopathology. As noted with findings of current PTSD symptomatology obtained by the DICA-R, levels of current PTSD declined substantially over the four-year post-wreck period, leaving less room for differentiation between survivors and controls.

**Impact of Events Scale.** Five studies have documented the utility of the IES as a measure of PTSD among children and adolescents (see Jones & Ribbe, 1991b; Jones, Ribbe, & Cunningham, in press; Keppel-Benson, 1992; Malmquist, 1986; Yule & Williams, 1990). In this investigation, where survivors were compared to matched controls, the IES did not differentiate significantly between groups except when examined by subscale. As indicated by subscale and total scores reported in several of the aforementioned investigations, this finding may be related to the amount of time since the wreck (see Table 5). In general, those subjects assessed within a time period closer to the traumatic event tended to score higher than subjects assessed much later. The notable exception is the high score of the survivors of the ferry boat sinking who were assessed 12 to 15 months post-trauma (Yule & Williams, 1990). It may be that these subjects had experienced greater degree and longer exposure to the traumatic stressor than subjects in the other studies. In addition, the ferry boat victims had continued in therapy for a year following the disaster, possibly kindling the symptoms to a greater degree than subjects in other investigations who were not in ongoing therapy related to the trauma.

Like the RI, the IES is also a measure of current PTSD symptoms, but assesses symptomatology within a narrower (and more recent) time frame. As such, the IES may have been more representative of the degree of impact of the wreck on current day-to-day functioning among survivors. Consistent with Solomon and Canino's (1990) argument, the IES intrusion subscale scores appeared to be better indicators of the degree of PTSD symptomatology than avoidance scores. Avoidance symptoms reported on the IES, however, appear to be more clearly linked to the stressor in the way the instrument is worded. Therefore, the avoidance scores on the IES may be more representative of avoidance symptomatology related to the wreck than current avoidance symptoms reported on the DICA-R.

**Other Measures of Stress-Related Symptomatology**

Less direct measures of psychopathology (i.e., the Beck Depression Inventory, the State-Trait Anxiety Inventory, the Anxiety Sensitivity Index, and the Anxiety
Frequency Checklist) did not distinguish between groups or detect gender differences. These findings are consistent with other findings reported in the literature. Keppel-Benson and Ollendick (in press) have reported that, in many instances, traumatized children’s scores on common measures of anxiety and depression (among others) are not significantly different from scores of normative samples. That is, this phenomenon may be an indication that "PTSD is a distinct diagnostic condition that may not be detected on general measures of psychopathology that do not specifically measure PTSD symptomatology" (p. 14).

Lyons (1991) has recommended that the "gold standard" in the assessment of PTSD should be the clinical interview. She noted that Weisenberg, Solomon, and Shwarzwald (1987) found only a 75% agreement between diagnoses based on psychometric indices and those based on clinical interview. Hence, she suggested that reliance on any single measure in the assessment of PTSD, such as a score on a psychometric index, should be avoided, and should only be included as a convergent measure of PTSD symptomatology.

Mental Arithmetic

Consistent with findings of other studies of PTSD that employed mental arithmetic as a trauma-neutral stressor to elicit HR and arithmetic performance as a dependent measure of the response to stress, but contrary to the neurological kindling hypothesis (van der Kolk et al., 1984) and Ornitz and Pynoos' (1989) findings with disinhibited startle modulation among children with PTSD, this study found no group differences in MA performance (Blanchard et al., 1982; Malloy et al., 1983; Foy et al., 1987). Blanchard et al. (1982), who monitored the psychophysiological responses of Vietnam combat veterans with PTSD while they engaged in a control task that required attention (mental arithmetic). Although veterans with PTSD responded to combat-related stimuli significantly more than they did to mental arithmetic (MA), the MA task did not significantly differentiate between matched combat veteran controls and those with PTSD.

Several possible explanations are offered concerning this negative finding. The most obvious possibility is that the MA task may have been too easy. This is doubtful, however, because subjects’ performance ranged from 40% to 100% accuracy. Apparently, some subjects found the task to present some difficulty. A second possibility is that the incentive to perform well varied among individuals. Although all
subjects were given the same instruction to "do their best to answer all the problems correctly," some subjects in each group expressed apprehension about the task, whereas others appeared to approach the task calmly. Thus, subjects may not have experienced the task as stressful enough to elicit significantly increased HR.

A third and more theoretically salient possibility is that, contrary to the hypothesis, the effects of the trauma did not lead to generalized changes in the autonomic nervous system which interfere with cognitive processes requiring attention and concentration. Any changes in autonomic reactivity experienced by the survivors, then, may be linked more specifically to trauma-related stimuli, as evidenced by group differences in HR in response to the bus crash interview (discussed below). This argument is consistent with Foy et al.'s (1987) conclusions that emotional responding in PTSD individuals is not a generalized emotional response, but a response to specific stimuli associated with the trauma. Stimuli linked more directly to the trauma may stimulate the affective network of associations, thus leading to greater physiological reactivity (Foa et al., 1989).

The most parsimonious explanation of the discrepancy in psychophysiological findings in relation to the control task (MA task), as well as those of the interview and self-report data, is that participants' reactivity to stressful stimuli had modulated with the passing of time and through continued re-exposure to trauma-related stimuli. Ornitz and Pynoos (1989) assessed children who had experienced life-threatening events 17 to 24 months previously and who met the diagnostic criteria for current PTSD. Although 55% of the sample in the present study met the criteria for PTSD related to the crash, they were all non-clinic referred, and only one survivor in the sample met the criteria for current PTSD. In addition, the current sample demonstrated a significant reduction in retrospectively reported PTSD symptomatology between the early period following the wreck and symptomatology experienced within the past month. The self-report data, then, strongly suggest an adaptation to the trauma, and, presumably, a concurrent reduction in reactivity in general, particularly to stimuli not directly associated with the wreck.

**Physiological Measures**

The main physiological finding was that survivors' HR increased significantly in response to the bus crash portion of the BCQ, relative to controls'. This finding seems to indicate that the bus crash interview was a more salient stimulus cue for
survivors than for controls. While the survivors were not exposed directly to stimuli related to wreck (i.e., photographs of the bus, sounds, or smells related to the wreck) due to ethical concerns, they were asked to recall the children with which they were sitting, where they were sitting, and what happened from the moment of impact to their escape and recovery. It is likely that these directed recollections elicited increases in autonomic activity among survivors. Controls were asked to recollect where they were, with whom they were, and what happened from the moment they heard about the wreck to the recovery phase of their experience.

The main difference between the experiences of the two groups is that the controls did not have to escape a potentially life-threatening situation, nor were they exposed to the fearful and anxious behavior of those who were being injured or killed. The threat to bodily integrity and life was not salient for the controls, whereas it was highly salient for the survivors.

While survivors and controls did not differ in terms of the rate of habituation to the MA task during the task itself, controls did evidence a return-to-baseline drop that exceeded that of the survivors. While this finding appears to support the notion that survivors' HR would not habituate as quickly as did controls', visual inspection of the data seem to indicate that survivors habituated quite well following the MA task. The controls' mean HR actually fell below the initial baseline level and close to the survivors' initial and return-to-baseline levels. Together with the fact that the mean of the controls' initial baseline HR was higher than that of the survivors' suggests that controls actually may have been more aroused initially, but quickly habituated to the situation.

Some investigations (Pitman et al., 1987; Pitman et al., 1990) have found that Vietnam veterans with current PTSD had higher resting (baseline) HR than did veterans without PTSD. This finding was not supported by the data in the current investigation. In fact, survivors who had diagnosable past PTSD evidenced lower (albeit, not significantly lower) mean HR at baseline than did survivors who had not met the criteria for past PTSD. Interestingly, however, the only survivor who met the criteria for current PTSD also had the highest baseline HR of the survivor group. Several possible explanations might be offered for these findings.

The first, most plausible explanation is that the cell sizes were very small. As such, sampling artifacts may explain the differences in baseline HR. Another possible explanation is that those survivors who had had diagnosable PTSD eventually
habituated and overcame their symptomatology, whereas the single survivor who met the criteria for current PTSD did not habituate. Her distress was consequently expressed both in self-reported symptoms and in continued high resting HR.

Another factor that may have contributed to a higher baseline rate among control subjects was the self-reported use of antidepressant medication by one female control subject who had a high baseline HR. Such medication has been linked to higher resting HR in similar psychophysiological studies of PTSD (S. P. Orr, personal communication, July 31, 1992). Indeed, this individual’s baseline HR was among the three highest heart rates in the entire sample.

Other Factors Related to Disaster Outcome

Age, either as a dichotomous or as a continuous factor, was not related to any measure of psychopathology used in this study. This was true whether data were collapsed across survivor and control groups, or when looking at the survivor group alone. Considering that subjects in the sample were at approximately the same developmental level, both cognitively and socially, this finding is not surprising. Related to this issue is the fact that the age range within the sample was limited to a five-year span, offering little room for statistical variability.

In addition, this sample was a non-clinical sample, composed entirely of subjects who were not hospitalized or in therapy. The fact that not all members of the survivor group met the criteria for diagnosable PTSD prior to the study may have limited the strength of conclusions, particularly in the area of physiological reactivity (i.e., HR).

Methodological Strengths and Limitations

In terms of the relationship between research methodology and post-disaster psychopathology rates, Rubonis and Bickman (1991) indicated that there are four research strategies that evinced lower effect sizes in the studies examined: 1) control group comparisons; 2) representative sampling technique; 3) prospective design; and 4) standardized instrumentation. The assumption under which Rubonis and Bickman (1991) interpreted meta-analytic findings relating to the methodological characteristics of disaster studies was that, as the methodological rigor of a study increased, the probability of achieving high effect sizes would decrease.

To the degree possible, the present study employed several strategies to enhance the methodological rigor of the data collection through a multi-method approach which
included the use of standardized assessment instrumentation (both a structured
diagnostic interview and psychometric indices of trauma-related psychopathology),
psychophysiological assessment, and control group comparisons. Subjects were
matched as closely as possible on a number of relevant characteristics, including age,
sex, race, socio-economic status, marital and parental status, length of residence in the
affected community, and religious affiliation. The methodology employed may have
reduced the likelihood of finding a spuriously high correlation between the trauma and

Other methodological strategies employed may have enhanced the reliability of
the findings. According to Rubonis and Bickman (1991), disaster studies need to
better define the population to which results are to be generalized. They indicated that,
in the past, studies have collapsed across male and female, examined overlapping age
groups, and combined clinical and non-clinical disaster victims. This study, however,
examined effects for gender and age effects within a narrow developmental range of 16
to 20 years of age.

In this way, the control group’s responses provided a context in which the
survivors’ level of psychopathology could be interpreted meaningfully. In addition to
control group comparisons, this study utilized standardized instrumentation, including
the DICA-R, the Impact of Events Scale, the Reaction Index, the State-Trait Anxiety
Inventory, the Beck Depression Inventory, the Anxiety Frequency Checklist, the
Anxiety Sensitivity Index, and the Fear Survey Schedule.

Some methodological factors may detract from the overall quality of findings in
this study, as well. Rubonis and Bickman (1991) indicated that studies that assess
psychopathology retrospectively are more likely to show higher disaster-
psychopathology relationships than prospective studies or those using an alternate
control group (see also Solomon, 1989). Given that this study was conducted
approximately four years post-disaster, it was not possible to collect data prospectively.
However, control data were obtained from an alternate control group, rather than in a
pre-post retrospective design, which may have yielded inflated reports of wreck-related
psychopathology among survivors.

Another methodological limitation of this study was that it did not employ a
representative sampling technique. Although meta-analytic findings did not show that
sampling strategy contributed to overall effect-size estimates, it may have an indirect
relationship with effect size. Indeed, the fact that, of the 25 survivors who initially
consented to participate in the study, only 11 came to scheduled interviews suggests that there is a strong possibility of selection bias in the sampling which directly affected the findings. It may be that only the healthiest survivors/families chose to participate. As mentioned above, only two of the participants had experienced burns in the wreck, whereas five other survivors who were burned did not participate.

In addition, there were five or six survivors who were not initially contacted for participation in the study because of their known hostility toward psychological or school intervention following the wreck. The small sample size and characteristics of those subjects who actually participated in the study limit the generalizability of the findings. Representative sampling, however, may have been difficult to achieve with this particular population, due to the limited number of individuals involved in the wreck. Due to the small sample size and limited generalizability of the research findings, an analysis of individual survivors’ response patterns is provided in Appendix F.

Future Research

The findings in this study, though limited in generalizability due to a small sample size, lead to a number of suggestions for future research in this area. First, an important finding of this study was that PTSD symptomatology appeared to decline over the period of four years following the bus wreck. This finding underscores the need for a prospective design. Assessment of initial physiological signs and symptoms (as in Appendix A-4) following a traumatic accident, followed by a longitudinal follow-up at intervals of one-, three-, six-, twelve-months, and two-, three-, and four-years would offer a clearer picture of the course of recovery/psychopathology, and would contribute to identifying variables which best predict psychological outcomes. This type of research design would control for memory distortions of retrospectively self-reported symptoms.

Related to the issue of identifying predictor variables is the need to sample larger, more homogeneous groups of accident survivors. This would allow researchers to examine the relationship of a greater number of pre-trauma variables (demographic characteristics such as age, gender, previous trauma history, pre-existing mental health status, etc.) to psychological outcomes following a singular traumatic event. Of particular interest in this study were the data suggesting that male and female survivors differed on the intrusion/avoidance dimension of PTSD. Future research
with larger sample sizes could examine differential patterns of PTSD symptomatology related to gender and their relation to psychological outcomes over time.

Another direction for future research in this area would be to assess more directly survivors’ experiences of within-trauma events that are associated with the development of PTSD or other stress-related symptomatology, such as threat to life or bodily integrity, severe physical harm or injury, exposure to the grotesque, etc. In addition, a careful analysis of post-trauma stressors, such as that proposed by the Conservation of Resource (COR) model of stress and coping (Hobfoll, 1989), may prove fruitful in explaining the course of post-traumatic symptomatology. Freedy, Shaw, Jarrell, and Masters (1992) has found that long-term, post-trauma variables of loss related to the COR model predict current psychological functioning better than some within-disaster variables.

Related to the theory of neurological activation of arousal mechanisms during and subsequent to trauma, future research could examine physiological reactivity within the context of a prospective design. Research efforts might focused on employing behavioral stressors that elicit a greater startle response to better evaluate victims’ autonomic reactivity. One such paradigm is the balloon-popping method in which subjects are blind-folded, and are instructed to blow up a large balloon while the experimenter counts out loud. Before the balloon is entirely full, the experimenter pops the balloon with a pin, thus eliciting a physiological response large enough to allow for discriminating between target subjects and controls. This paradigm more closely parallels that of the auditory pre-stimulation techniques employed by Ornitz and Pynoos (1989) which found support for the theory of neurological hyper-potentiation in child trauma victims.

Finally, another paradigm for assessing physiological reactivity in trauma victims that could be employed in the future with child and adolescent trauma victims is that used with Vietnam veterans. Sounds and scenes related to the trauma, as well as personalized trauma scripts could be presented to subjects while assessing physiological reactivity. Of course, such techniques would need to be approved within a human subjects framework of costs and benefits to research subjects who are minors. But, perhaps, within the context of providing therapeutic treatment, such research techniques could actually function as adjuncts to re-exposure and flooding therapy.
References


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<td>Female</td>
<td>White</td>
<td>17</td>
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</tr>
<tr>
<td>6</td>
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</tr>
<tr>
<td></td>
<td>Control 14</td>
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<td>White</td>
<td>18</td>
<td>56</td>
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</tr>
<tr>
<td>7</td>
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<td>Black</td>
<td>19</td>
<td>46</td>
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<tr>
<td></td>
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<tr>
<td>8</td>
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<tr>
<td></td>
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<td>18</td>
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<td>9</td>
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<td>20</td>
<td>23</td>
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</tr>
<tr>
<td></td>
<td>Control 17</td>
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<td>White</td>
<td>20</td>
<td>27</td>
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<td>10</td>
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<td>16</td>
<td>54</td>
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<tr>
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<td>Control 04</td>
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<td>53</td>
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<tr>
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<td>White</td>
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<td>11</td>
<td>Survivor 25</td>
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<td>White</td>
<td>17</td>
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<tr>
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<td>Control 10</td>
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<td>White</td>
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Table 2.
Percentages of Survivors and Controls Reporting Past PTSD Symptoms

<table>
<thead>
<tr>
<th>PTSD Symptoms By Criterion</th>
<th>Group (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Survivors (n = 11)</td>
</tr>
<tr>
<td><strong>Reexperiencing (Intrusion)</strong></td>
<td></td>
</tr>
<tr>
<td>1. Thinking about wreck a lot</td>
<td>91</td>
</tr>
<tr>
<td>2. Dreaming about wreck repeatedly</td>
<td>64</td>
</tr>
<tr>
<td>3. Sense of wreck recurring</td>
<td>27</td>
</tr>
<tr>
<td>4. Upset by reminders of wreck</td>
<td>64</td>
</tr>
<tr>
<td><strong>Avoidance</strong></td>
<td></td>
</tr>
<tr>
<td>5. Thinking about wreck when trying not to</td>
<td>73</td>
</tr>
<tr>
<td>6. Avoiding things associated with wreck</td>
<td>64</td>
</tr>
<tr>
<td>7. Amnesia for details of wreck</td>
<td>82</td>
</tr>
<tr>
<td>8. Loss of interest in usual activities</td>
<td>18</td>
</tr>
<tr>
<td>9. Loss of interest in people</td>
<td>27</td>
</tr>
<tr>
<td>10. Loss of caring feelings</td>
<td>9</td>
</tr>
<tr>
<td>11. Outlook on future changed</td>
<td>9</td>
</tr>
<tr>
<td><strong>Increased Arousal</strong></td>
<td></td>
</tr>
<tr>
<td>12. Trouble falling/staying asleep</td>
<td>73</td>
</tr>
<tr>
<td>13. Increased irritability &amp; temper outbursts</td>
<td>64</td>
</tr>
<tr>
<td>14. Decreased attention</td>
<td>73</td>
</tr>
<tr>
<td>15. Increased restlessness</td>
<td>64</td>
</tr>
<tr>
<td>16. Increased startle reflex</td>
<td>46</td>
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<tr>
<td>17. Increased autonomic reactivity</td>
<td>82</td>
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</table>
Table 3.
*Percentages of Survivors and Controls Reporting Current PTSD Symptoms*

<table>
<thead>
<tr>
<th>PTSD Symptoms By Criterion</th>
<th>Survivors ($n = 11$)</th>
<th>Controls ($n = 12$)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reexperiencing (Intrusion)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Thinking about wreck a lot</td>
<td>46</td>
<td>8</td>
</tr>
<tr>
<td>2. Dreaming about wreck repeatedly</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>3. Sense of wreck recurring</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>4. Upset by reminders of wreck</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td><strong>Avoidance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Thinking about wreck when trying not to</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>6. Avoiding things associated with wreck</td>
<td>53</td>
<td>0</td>
</tr>
<tr>
<td>7. Amnesia for details of wreck</td>
<td>82</td>
<td>0</td>
</tr>
<tr>
<td>8. Loss of interest in usual activities</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9. Loss of interest in people</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td>10. Loss of caring feelings</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11. Outlook on future changed</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Increased Arousal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Trouble falling/staying asleep</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>13. Increased irritability &amp; temper outbursts</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>14. Decreased attention</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>15. Increased restlessness</td>
<td>18</td>
<td>8</td>
</tr>
<tr>
<td>16. Increased startle reflex</td>
<td>36</td>
<td>0</td>
</tr>
<tr>
<td>17. Increased autonomic reactivity</td>
<td>27</td>
<td>25</td>
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Table 4.
Percentages of Survivors and Controls Classified by Reaction Index Severity Ratings Compared to Children Involved in Automobile Accidents: Pynoos & Nader (1988)
Classification

<table>
<thead>
<tr>
<th>RI Severity Rating</th>
<th>Auto Accident\textsuperscript{a}</th>
<th>Survivors</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>%</td>
<td>$n$</td>
</tr>
<tr>
<td>No Trauma</td>
<td>12</td>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>Mild Trauma</td>
<td>24</td>
<td>48</td>
<td>4</td>
</tr>
<tr>
<td>Moderate Trauma</td>
<td>8</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Severe Trauma</td>
<td>6</td>
<td>12</td>
<td>2</td>
</tr>
</tbody>
</table>

\textsuperscript{a}Auto accident refers to a sample of children ($n = 50$) who were involved in various auto accidents (Keppel-Benson, 1992).
Table 5.
Percentages of Survivors and Controls Classified by Reaction Index Severity Ratings: Frederick (1988) Classification

<table>
<thead>
<tr>
<th>RI Severity Rating</th>
<th>Survivors</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$n$</td>
<td>%</td>
</tr>
<tr>
<td>Doubtful</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>Mild Trauma</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>Moderate Trauma</td>
<td>3</td>
<td>27</td>
</tr>
<tr>
<td>Severe Trauma</td>
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<td>0</td>
</tr>
<tr>
<td>Very Severe</td>
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<td>9</td>
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Table 6.
*Mean IES Scores Across Five Studies by Age and Time Since Disaster*

<table>
<thead>
<tr>
<th>Study</th>
<th>Ages</th>
<th>n</th>
<th>Time</th>
<th>Intrusion</th>
<th>Avoidance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jones &amp; Ribbe (1991a)</td>
<td>7-18</td>
<td>23</td>
<td>1 1/2 mos.</td>
<td>17.1</td>
<td>22.8</td>
<td>39.8</td>
</tr>
<tr>
<td>Victims</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td>10</td>
<td></td>
<td>12.0</td>
<td>11.4</td>
<td>23.4</td>
</tr>
<tr>
<td>Yule &amp; Williams (1990)</td>
<td>5-15</td>
<td>13</td>
<td>3-6 mos.</td>
<td>19.3</td>
<td>27.6</td>
<td>46.9</td>
</tr>
<tr>
<td>Victims</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(follow-up)</td>
<td>6-16</td>
<td>10</td>
<td>12-15 mos.</td>
<td>17.0</td>
<td>21.0</td>
<td>38.0</td>
</tr>
<tr>
<td>Jones &amp; Ribbe (1991b)</td>
<td>14-19</td>
<td>25</td>
<td>4 mos.</td>
<td>13.4</td>
<td>14.6</td>
<td>28.0</td>
</tr>
<tr>
<td>Victims</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td>13</td>
<td></td>
<td>11.3</td>
<td>10.9</td>
<td>22.2</td>
</tr>
<tr>
<td>Keppel-Benson (1992)</td>
<td>6-16</td>
<td>50</td>
<td>2-18 mos.</td>
<td>-----</td>
<td>-----</td>
<td>16.2</td>
</tr>
<tr>
<td>Victims</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus Wreck (1993)</td>
<td>16-20</td>
<td>11</td>
<td>41-46 mos.</td>
<td>8.8</td>
<td>6.0</td>
<td>14.8</td>
</tr>
<tr>
<td>Victims</td>
<td></td>
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<tr>
<td>Controls</td>
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<td>12</td>
<td></td>
<td>2.5</td>
<td>4.3</td>
<td>6.8</td>
</tr>
</tbody>
</table>
Table 7.
Means and Standard Deviations of the Number of Past Bus-Related Intrusion, Avoidance, Arousal & Total PTSD Symptoms Reported on the DICA-R: Group by Gender

| PTSD Symptoms By Criterion | Survivors | | | Controls | | |
|---------------------------|-----------|-----------|-----------|-----------|-----------|
|                           | Male (n=5) | Female (n=6) | Group (n=11) | Male (n=5) | Female (n=7) | Group (n=12) |
| B. Intrusion              | M         | 2.6       | 2.5       | 2.5       | 0.6       | 0.7       | 0.7       |
|                           | SD        | 0.9       | 1.0       | 0.9       | 0.5       | 1.5       | 1.2       |
| C. Avoidance              | M         | 3.4       | 2.3       | 2.8       | 1.0       | 0.6       | 0.8       |
|                           | SD        | 2.8       | 0.8       | 1.9       | 1.2       | 1.0       | 1.1       |
| D. Arousal                | M         | 2.8       | 5.0       | 4.0       | 2.0       | 1.6       | 1.8       |
|                           | SD        | 2.6       | 1.1       | 2.1       | 1.6       | 1.9       | 1.7       |
| TOTAL                     | M         | 8.8       | 9.5       | 9.2       | 3.6       | 2.9       | 3.2       |
|                           | SD        | 6.0       | 2.3       | 4.1       | 3.2       | 4.2       | 3.7       |
### Table 8.

**Means and Standard Deviations of the Number of Current Bus-Related DICA-R Intrusion, Avoidance, Arousal & Total PTSD Symptoms Reported: Group by Gender**

<table>
<thead>
<tr>
<th>PTSD Symptoms By Criterion</th>
<th>Survivors</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (n=5)</td>
<td>Female (n=6)</td>
</tr>
<tr>
<td>B. Intrusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0.4</td>
<td>1.3</td>
</tr>
<tr>
<td>SD</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>C. Avoidance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>SD</td>
<td>1.1</td>
<td>0.8</td>
</tr>
<tr>
<td>D. Arousal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>0.4</td>
<td>2.0</td>
</tr>
<tr>
<td>SD</td>
<td>0.9</td>
<td>1.6</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2.8</td>
<td>5.2</td>
</tr>
<tr>
<td>SD</td>
<td>2.2</td>
<td>2.5</td>
</tr>
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Table 9.

*Means and Standard Deviations of the Number of Past & Current Bus-Related Psychiatric PTSD Criteria Met: Group by Gender*

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<tr>
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<th>Survivors</th>
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<th>Controls</th>
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<tbody>
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<td>Male (n=5)</td>
<td>Female (n=6)</td>
<td>Group (n=11)</td>
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<td>2.5</td>
<td>2.4</td>
<td>1.4</td>
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<td>0.5</td>
<td>0.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Current</td>
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<td>1.3</td>
<td>0.0</td>
</tr>
<tr>
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<td>1.0</td>
<td>0.8</td>
<td>0.9</td>
<td>0.0</td>
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</table>
Table 10.
Means and Standard Deviations of the Sum of Intrusion, Avoidance, Arousal Items & Total Reaction Index Scores: Group by Gender

<table>
<thead>
<tr>
<th>PTSD Criterion</th>
<th>Survivors</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male ((n=5))</td>
<td>Female ((n=6))</td>
</tr>
<tr>
<td>B. Intrusion</td>
<td>(M)</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>2.3</td>
</tr>
<tr>
<td>C. Avoidance</td>
<td>(M)</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>3.4</td>
</tr>
<tr>
<td>D. Arousal</td>
<td>(M)</td>
<td>7.2</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>4.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>(M)</td>
<td>20.8</td>
</tr>
<tr>
<td></td>
<td>(SD)</td>
<td>12.4</td>
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Table 11.
Means and Standard Deviations of IES Intrusion, Avoidance & Total Scores: Group by Gender

<table>
<thead>
<tr>
<th>IES Subscale</th>
<th>Survivors</th>
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<th>Controls</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>Female $(n=6)$</td>
<td>Group $(n=11)$</td>
<td>Male $(n=5)$</td>
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<tr>
<td>Intrusion</td>
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<td>9.8</td>
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<tr>
<td></td>
<td>$SD$</td>
<td>7.0</td>
<td>10.1</td>
<td>8.5</td>
</tr>
<tr>
<td>Avoidance</td>
<td>$M$</td>
<td>7.2</td>
<td>5.0</td>
<td>6.0</td>
</tr>
<tr>
<td></td>
<td>$SD$</td>
<td>5.0</td>
<td>5.8</td>
<td>5.3</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$M$</td>
<td>14.8</td>
<td>14.8</td>
<td>14.8</td>
</tr>
<tr>
<td></td>
<td>$SD$</td>
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<td>13.0</td>
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</table>
Table 12.
Means and Standard Deviations of the Number of Endorsed IES Intrusion & Avoidance Subscale Items & Total Items: Group by Gender

<table>
<thead>
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<th>IES Subscale</th>
<th>Survivors</th>
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<th></th>
<th></th>
<th>Controls</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male (n=5)</td>
<td>Female (n=6)</td>
<td>Group (n=11)</td>
<td></td>
<td>Male (n=5)</td>
<td>Female (n=7)</td>
<td>Group (n=12)</td>
<td></td>
</tr>
<tr>
<td>Intrusion</td>
<td>M</td>
<td>3.6</td>
<td>4.2</td>
<td>3.9</td>
<td></td>
<td>1.4</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td>3.4</td>
<td>2.5</td>
<td>2.8</td>
<td></td>
<td>1.5</td>
<td>1.9</td>
<td>1.7</td>
</tr>
<tr>
<td>Avoidance</td>
<td>M</td>
<td>3.2</td>
<td>2.7</td>
<td>2.9</td>
<td></td>
<td>1.6</td>
<td>1.9</td>
<td>1.8</td>
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<tr>
<td></td>
<td>SD</td>
<td>2.8</td>
<td>2.9</td>
<td>2.7</td>
<td></td>
<td>3.0</td>
<td>2.3</td>
<td>2.5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>M</td>
<td>6.8</td>
<td>6.8</td>
<td>6.8</td>
<td></td>
<td>3.0</td>
<td>3.4</td>
<td>3.3</td>
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<tr>
<td></td>
<td>SD</td>
<td>5.8</td>
<td>5.1</td>
<td>5.2</td>
<td></td>
<td>4.2</td>
<td>3.5</td>
<td>3.6</td>
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</table>
Table 13.
Means and Standard Deviations of STAI Subscale Scores By Group & Gender
Compared to Same-Age Norms

<table>
<thead>
<tr>
<th>STAI Subscale</th>
<th>Survivors</th>
<th></th>
<th>Controls</th>
<th></th>
<th>High School Students</th>
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<tbody>
<tr>
<td></td>
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<td>Female</td>
<td>Male</td>
<td>Female</td>
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<td>Female</td>
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<tr>
<td></td>
<td>(n=5)</td>
<td>(n=6)</td>
<td>(n=5)</td>
<td>(n=7)</td>
<td>(n=202)</td>
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<tr>
<td>State</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>29.2</td>
<td>33.7</td>
<td>28.6</td>
<td>26.7</td>
<td>39.5</td>
<td>40.5</td>
</tr>
<tr>
<td></td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td>9.6</td>
<td>9.6</td>
</tr>
<tr>
<td>Trait</td>
<td>M</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31.0</td>
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<td>35.6</td>
<td>40.2</td>
<td>41.0</td>
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<tr>
<td></td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td>8.7</td>
<td>8.3</td>
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Table 14.
*Means and Standard Deviations of BDI, ASI, & AFC Scores: Group by Gender*

<table>
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<th>Scale</th>
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<th>Controls</th>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>2.2</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td>2.7</td>
<td>5.8</td>
</tr>
<tr>
<td>ASI</td>
<td></td>
<td></td>
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<td></td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td></td>
<td>8.4</td>
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<td></td>
<td>6.2</td>
<td>11.5</td>
</tr>
<tr>
<td>AFC</td>
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</tr>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
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<td>1.8</td>
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<tr>
<td></td>
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Table 15.
Correlations Among Dependent Measures of Current PTSD Symptomatology

<table>
<thead>
<tr>
<th></th>
<th>DICA-R</th>
<th>Reaction Index</th>
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<tr>
<td>Impact of Events Scale</td>
<td>.78**</td>
<td>.76**</td>
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<tr>
<td>Reaction Index</td>
<td>.78**</td>
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Note. Survivors only \((n = 11)\).

** \(p < .02\).
Table 16.
Correlations Among Measures of Current PTSD Symptomatology and Other Stress-Related Symptomatology

<table>
<thead>
<tr>
<th></th>
<th>DICA-R</th>
<th>RI</th>
<th>IES</th>
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<tr>
<td>Beck Depression Inventory</td>
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<td>.87***</td>
<td>.67</td>
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<td>.48</td>
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<tr>
<td>Trait Anxiety</td>
<td>.86***</td>
<td>.78*</td>
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<tr>
<td>Anxiety Sensitivity</td>
<td>.82**</td>
<td>.69</td>
<td>.64</td>
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<tr>
<td>Anxiety Frequency</td>
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Note. Survivors only (n = 11).
* p < .05.
** p < .02.
*** p < .005.
Table 17.

Correlations Among Current DICA-R Symptom Groups and Other Stress-Related Symptomatology

<table>
<thead>
<tr>
<th></th>
<th>DICA-R Symptom Groups</th>
<th></th>
<th></th>
<th></th>
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<td></td>
<td>Intrusion</td>
<td>Avoidance</td>
<td>Arousal</td>
<td></td>
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<tr>
<td>Beck Depression Inventory</td>
<td>.35</td>
<td>.58</td>
<td>.79**</td>
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<td>State Anxiety</td>
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<td>.72</td>
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<td>Anxiety Sensitivity</td>
<td>.37</td>
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</tr>
<tr>
<td>Anxiety Frequency</td>
<td>.60</td>
<td>.62</td>
<td>.68</td>
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</tr>
</tbody>
</table>

Note. Survivors only (n = 11).

* p < .05.
* p < .02.
Table 18.
Correlations Among Reaction Index Symptom Groups and Other Stress-Related Symptomatology

<table>
<thead>
<tr>
<th></th>
<th>Reaction Index Symptom Groups</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Intrusion</td>
</tr>
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<td>Beck Depression Inventory</td>
<td>.88***</td>
</tr>
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<td>State Anxiety</td>
<td>.67</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>.75*</td>
</tr>
<tr>
<td>Anxiety Sensitivity</td>
<td>.78*</td>
</tr>
<tr>
<td>Anxiety Frequency</td>
<td>.85***</td>
</tr>
</tbody>
</table>

Note. Survivors only ($n = 11$).
* $p < .05$.
** $p < .02$.
*** $p < .005$. 
Table 19.
Correlations Among Impact of Events Scale Subscale Scores and Other Stress-Related Symptomatology

<table>
<thead>
<tr>
<th>Impact of Events Subscales</th>
<th>Intrusion</th>
<th>Avoidance</th>
</tr>
</thead>
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<td>Beck Depression Inventory</td>
<td>.64</td>
<td>.61</td>
</tr>
<tr>
<td>State Anxiety</td>
<td>.41</td>
<td>.52</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td>.70</td>
<td>.57</td>
</tr>
<tr>
<td>Anxiety Sensitivity</td>
<td>.64</td>
<td>.55</td>
</tr>
<tr>
<td>Anxiety Frequency</td>
<td>.74*</td>
<td>.64</td>
</tr>
</tbody>
</table>

Note. Survivors only (n = 11).
* \( p < .05 \).
Figure 1. Number of intrusion, avoidance, arousal, & total DICA-R symptoms: past vs. current.
Figure 2. Mean HR change scores across periods: survivors vs. controls.
Figure 3. Mean HR change between periods showing main effect for time.
Figure 4. Mean HR by period: survivors vs. controls.
Figure 5. Mean HR response scores across periods: survivors vs. controls.
Figure 6. Mean HR response scores across periods: males vs. females.
Figure 7. Mean HR response scores across periods: by group & gender.
Figure 8. Mean HR standard deviation across periods: survivors vs. controls.
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Appendix A-1

Diagnostic Criteria for DSM-III-R Post-Traumatic Stress Disorder

A. Experienced traumatic event (defined above).

B. Re-experiencing. The traumatic event is persistently reexperienced in at least one of the following ways:
   1. recurrent and intrusive distressing recollections of the event (in young children, repetitive play with themes or aspects of the trauma present)
   2. recurrent distressing dreams of the event
   3. sudden acting or feeling as if the traumatic event were recurring (includes sense of reliving the experience, illusions, hallucinations, and dissociative [flashback] episodes, even those that occur upon awakening)
   4. intense psychological distress at exposure to events that symbolize or resemble an aspect of the traumatic event, including anniversaries of the trauma

C. Avoidance and numbing. Persistent avoidance of stimuli associated with the trauma or numbing of general responsiveness (not present before the trauma), as indicated by at least three of the following:
   1. efforts to avoid thoughts or feelings associated with the trauma
   2. efforts to avoid activities or situations that arouse recollections of the trauma
   3. inability to recall an important aspect of the trauma (psychogenic amnesia)
   4. markedly diminished interest in significant activities (in young children, loss of recently acquired developmental skills such as toilet training or language skills)
   5. feeling of detachment or estrangement from others
   6. restricted range of affect, e.g., unable to have loving feelings
   7. sense of foreshortened future, e.g., does not expect to have a career, marriage, or children, or a long life

D. Increased arousal. Persistent symptoms of increased arousal (not present before trauma), as indicated by at least two of the following:
   1. difficulty falling or staying asleep
   2. irritability or outbursts of anger
   3. difficulty concentrating
   4. hypervigilance
   5. exaggerated startle response
   6. physiologic reactivity upon exposure to events that symbolize or resemble an aspect of the traumatic event

E. Duration of the disturbance (reexperiencing, avoidance, and increased arousal symptoms) of at least one month.
Appendix A-2

Symptoms and Signs Related to Intrusive Experiences and Behavior

- Hypervigilance, including hypersensitivity to associated events
- Startle reactions
- Illusions or pseudohallucinations, including sensation of recurrence
- Intrusive-repetitive thoughts, images, emotions, and behaviors
- Overgeneralization of associations
- Inability to concentrate on other topics because of preoccupation with event-related themes
- Labile or explosive entry into intensely emotional and undermodulated states of mind
- Sleep and dream disturbances, including recurrent dreams
- Sensations or symptoms of fight or flight readiness (or of exhaustions from chronic arousal), including tremor, nausea, diarrhea and sweating (adrenergic, noradrenergic, or histaminic arousals)
- Search for lost persons or situations, compulsive repetitions

Note. Adapted from Horowitz, (1988).
Symptoms and Signs Related to Denial or Numbing Experiences and Behavior

- Daze
- Selective inattention
- Inability to appreciate significance of stimuli
- Amnesia (complete or partial)
- Inability to visualize memories
- Disavowal of meanings of stimuli
- Constriction and inflexibility of thought
- Presence of fantasies to counteract reality
- A sense of numbness or unreality, including detachment and estrangement
- Over-controlled states of mind, including behavioral avoidances
- Sleep disturbances (e.g., too little or too much)
- Tension-inhibition responses of the autonomic nervous system, with felt sensations such as bowel symptoms, fatigue, and headache
- Frantic overactivity to jam attention with stimuli
- Withdrawal from ordinary life activities

Note. Adapted from Horowitz, (1988).
Appendix A-4

Responses to Trauma

<table>
<thead>
<tr>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helplessness</td>
<td>Increased heart rate</td>
</tr>
<tr>
<td>Headaches</td>
<td>Feeling faint (light-headedness and unsteadiness)</td>
</tr>
<tr>
<td>Dyspnea</td>
<td>Tingling sensations in the arms or hands</td>
</tr>
<tr>
<td>Hyperventilation</td>
<td>Inability to remember recent events</td>
</tr>
<tr>
<td>Nausea</td>
<td>Hypersensitivity to sudden or rapidly changing stimuli (noise, light)</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Sleep disturbances</td>
</tr>
<tr>
<td>Excessive sweating</td>
<td>Feelings that familiar things are strange or unreal</td>
</tr>
<tr>
<td>Dizziness</td>
<td>Difficulties in concentration</td>
</tr>
<tr>
<td>Blurry vision</td>
<td>Hot flashes or flushing</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>Urinary or fecal incontinence</td>
</tr>
<tr>
<td>Nervousness</td>
<td>Ringing in the ears</td>
</tr>
<tr>
<td>Restlessness</td>
<td>Outbursts of anger</td>
</tr>
<tr>
<td>Pain</td>
<td>Extreme trembling or shaking</td>
</tr>
<tr>
<td>Irritability</td>
<td></td>
</tr>
<tr>
<td>Nightmares</td>
<td></td>
</tr>
</tbody>
</table>

Note. Adapted from Scrignor, 1984.
Biological Alterations Associated with PTSD

1. Sympathetic nervous system hyperarousal
   a. Elevated baseline sympathetic physiological indices.
   b. Sympathetic psychophysiologic response upon exposure to traumagenic stimuli.
   c. Elevated urinary catecholamine levels.
   d. Reduced platelet MAO activity.
   e. Down-regulation of adrenergic receptors.

   a. Decreased urinary cortisol levels.
   b. HPA suppression following dexamethasone.
   c. Unique elevation of urinary catecholamine-cortisol ratio.

3. Abnormalities of the endogenous opioid system.
   a. Stress induced analgesia by traumagenic stimuli.
   b. General lowering of the pain threshold at rest.

4. Sleep abnormalities.
   a. Initiating and maintaining sleep:
      increased sleep latency, decreased total sleep time, decreased sleep efficiency, increased number of awakenings, increased body movements.
   b. Sleep architecture: changes are controversial.
   c. Traumatic nightmares are unique.

Note: Adapted from Friedman, 1991.
APPENDIX B: Control Selection Screening

Name ___________________________ Date ______________________

Are you willing to participate in the study described in the letter above?
NO _______ If "NO," then STOP HERE.
YES _______ If "YES," then please provide the following information.

Are you related to or a close friend of any of the people who were riding the bus?
YES _______ If "YES," then STOP HERE.
NO _______ If "NO," then please provide the following information:

Were you living in Hardin County, KY at the time of the bus crash in May, 1988?
NO _______ If "NO," then STOP HERE.
YES _______ If "YES," then please provide the following information.

Age _______ Sex _______ Ethnic Background ______________________
Address __________________________ Phone ______________________
Religious Preference ________________ Education ________________
[Parents'] Occupation ________________ Marital Status _______________

Have you ever experienced one of the following events?

Please check all that apply: Year Injury Damage to home

- Earthquake
- Fire
- Flood
- Mudslide
- Severe Storm
- Toxic Waste
- Other Disaster
- Severe Injury
- Car Accident
- Getting beat up
- Witness injury to other
- Severe Illness
- Other

Briefly describe the event and your experience (How did it happen?):

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
### Appendix C: Mental Arithmetic Problems

<table>
<thead>
<tr>
<th>Item</th>
<th>Problem</th>
<th>Answer</th>
<th>Response</th>
<th>Key</th>
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<td>55</td>
<td>W</td>
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<td>4</td>
<td>227 - 14</td>
<td>113</td>
<td>W</td>
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<td>559 - 42</td>
<td>517</td>
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<td>65 - 56</td>
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<td>R</td>
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<td>27</td>
<td>W</td>
<td></td>
</tr>
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<td>16</td>
<td>993 - 781</td>
<td>125</td>
<td>W</td>
<td></td>
</tr>
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<td>17</td>
<td>82 + 15</td>
<td>107</td>
<td>W</td>
<td></td>
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<tr>
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<td>218</td>
<td>W</td>
<td></td>
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<td>19</td>
<td>145 - 27</td>
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<td>R</td>
<td></td>
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<td></td>
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<td>62 + 47</td>
<td>109</td>
<td>R</td>
<td></td>
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<td>25</td>
<td>29 - 11</td>
<td>18</td>
<td>R</td>
<td></td>
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<td>27</td>
<td>87 - 19</td>
<td>68</td>
<td>R</td>
<td></td>
</tr>
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<td>28</td>
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<td>18 + 45</td>
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</tr>
<tr>
<td>30</td>
<td>693 - 671</td>
<td>36</td>
<td>W</td>
<td></td>
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</tbody>
</table>
Appendix D-1: Information and Consent Letter to Survivors’ Parents

Greetings from Virginia! The wonderful celebration of Christmas is in the air, and many of you are looking forward to a holiday from school or work in the next few weeks. I know that I’m anticipating a break from my teaching duties here at Hollins College in Roanoke, Virginia soon.

As you may recall, Linda Probus contacted you or your son or daughter by phone and sent you a letter in April of this year about talking with us about how your son or daughter has been doing emotionally over the last 42 months. Then, during the summer, I sent a letter to you suggesting that Linda and I would be coming out to Radcliff in August to meet with you. It is now December, and we finally are ready to come out and talk with your son or daughter. The reason for the delay was that many people at Virginia Tech (me, the Human Subjects Committee, the Institutional Review Board, and other concerned individuals) and Linda at Mountain Home wanted to make sure that your son or daughter’s well-being would be the first and foremost priority in all aspects of our visit before we come. Your child’s well-being is really very important, and Linda and I have been extremely pleased with the amount of care and concern that has gone into the preparation for your son or daughter’s visit with us.

Right now, it looks like Linda and I will be able to come to Radcliff during the first week of January. We will be able to meet with several people between the 2nd and 5th. Others, we will meet at the end of January or at the end of March. Instead of meeting at Radcliff Middle School, as previously planned, we will meet at the Communicare building in Radcliff. How does that sound to you?

Let me tell you just a little about what we will be doing when we meet your son or daughter. Some of the information we would like to obtain about the long-term effects of trauma involves how young people’s heart rate and sweat gland activity is affected. So the first thing we’ll do is ask him or her to do some simple addition and subtraction problems while his or her heart rate and sweating rate is measured (sweating is measured by placing two small band-aid-like sensors on the fingertips). Then we’ll talk about their experiences and feelings at the time of the wreck and since the wreck, and they will mark their answers to some questions about thoughts and feelings that they’ve had on some questionnaires. After the formal interview period is over (about an hour and a half), Linda and I will take some time to sit and chat with your son or daughter informally. I know that Linda is eager to see your son or daughter again and
get caught up on what they are doing nowadays. I, too, am eager to meet with them and to get to know them. I suspect that you and they will have a lot of questions about what we're doing and what good the information will do—we'll be glad to answer them for you then.

Attached to this letter is a form called "Parental Consent." Please read it carefully and sign it if you plan to participate in this project. I've included a letter addressed to your son or daughter so they will know what is going on, too. He or she must read and sign the "Parental Consent" form that is included with the letter addressed to him or her, if they agree to participate. If you plan to take part in this important project, could you and your son or daughter sign the consent forms and send them to the address at the top of this letter as soon as possible? I've included a stamp for mailing, should you care to use it. If you have any questions, please feel free to call me at the phone number above (I'll call you right back so you won't be charged for long distance) or call me collect at home in the evenings after 6:00 p.m. or on the weekend at (703) 953-0546. As soon as I get your returned letter, either I or Linda will call you to schedule a time to meet with your son or daughter.

With warm wishes for the Christmas Season,

David Paul Ribbe, M.A., M.S.
Appendix D-2: Information and Consent Letter to Survivors

Greetings from Virginia! The wonderful celebration of Christmas is in the air, and many of you are looking forward to a holiday from school or work in the next few weeks. I know that I'm anticipating a break from my teaching duties here at Hollins College in Roanoke, Virginia soon.

As you may recall, Linda Probus contacted you by phone and sent you a letter in April of this year about talking with us about how you've been doing emotionally over the last 42 months. Then, during the summer, I sent a letter to you suggesting that Linda and I would be coming out to Radcliff in August to meet with you. It is now December, and we finally are ready to come out and talk with you. The reason for the delay was that many people at Virginia Tech (me, the Human Subjects Committee, the Institutional Review Board, and other concerned individuals) and Linda at Mountain Home wanted to make sure that your well-being would be the first and foremost priority in all aspects of our visit before we come. Your well-being is really very important, and Linda and I have been extremely pleased with the amount of care and concern that has gone into the preparation for your visit with us.

Right now, it looks like Linda and I will be able to come to Radcliff during the first week of January. We will be able to meet with several survivors between the 21st and 5th. Others, we will meet at the end of January or at the end of March. Instead of meeting at Radcliff Middle School, as previously planned, we will meet at the community center in Radcliff. How does that sound to you?

Let me tell you just a little about what we will be doing when we meet. Some of the information we would like to obtain about the long-term effects of trauma involves how young people's heart rate and sweat gland activity is affected. So the first thing we'll do is ask you to do some simple addition and subtraction problems while your heart rate and sweating rate is measured (sweating is measured by placing two small band-aid-like sensors on your fingertips). Then we'll talk about your experiences and feelings at the time of the wreck and since the wreck, and you will mark your answers to some questions about thoughts and feelings that you've had on some questionnaires. After the formal interview period is over (about an hour and a half), Linda and I will take some time to sit and chat with you informally. I know that Linda is eager to see you again and get caught up on what you're doing nowadays. I, too, am eager to meet you and to get to know you. I suspect that you'll have a lot of questions about what
we're doing and what good the information will do—we'll be glad to answer them for you then.

Attached to this letter is a form called "Statement of Informed Consent." Please read it carefully and sign it if you plan to participate in this project. I've included a letter addressed to your parents so they will know what is going on. Your parents (if you are under 18 years old) must read and sign the "Parental Consent" form that is included with the letter addressed to them, if they agree to allow you to participate. If you plan to take part in this important project, could you and your parents sign the consent forms and send them to the address at the top of this letter as soon as possible? If you have any questions, please feel free to call me at the phone number above (I'll call you right back so you won't be charged for long distance) or call me collect at home in the evenings after 6:00 p.m. or on the weekend at (703) 953-0546. As soon as I get your returned letter, either I or Linda will call you to schedule a time to meet with you.

With warm wishes for the Christmas Season,

David Paul Ribbe

David Paul Ribbe, M.A., M.S.
Appendix D-3: Information and Consent Letter to Controls’ Parents

Dear Mr. and/or Mrs. C.,

Greetings from Virginia! I wonder what you expected when your son or daughter heard about this research project. Well, let me tell you just a little about what we will be doing when we meet your child. Some of the information we would like to obtain about the long-term effects of trauma involves how young people’s heart rate and sweat gland activity is affected. When your son/daughter and I talked on the phone, he/she indicated that you lived in the area about four years ago when the Radcliff church bus crash occurred. Some of what we will talk about will be about the wreck and how it affected your child. The first thing we’ll do is ask him or her to do some simple addition and subtraction problems while his or her heart rate and sweating rate is measured (sweating is measured by placing two small band-aid-like sensors on the fingertips). Then we’ll talk about their experiences and feelings at the time of the wreck and since the wreck, and they will mark their answers to some questions about thoughts and feelings that they’ve had on some questionnaires. After the formal interview period is over (about an hour and a half), Terry Bailey (my research assistant from Hollins College) and I will take some time to sit and chat with your son or daughter informally. I suspect that you and they will have a lot of questions about what we’re doing and what good the information will do—we’ll be glad to answer them for you then. Your child will be reimbursed $20 for participating.

Attached to this letter is a form called "Parental Consent." Please read it carefully and sign it if you agree to allow your son or daughter (if he or she is under 18 years old) to participate in this project. Your son or daughter must read and sign the "Statement of Informed Consent" form that is included with the letter addressed to him or her, if they agree to participate. If you plan to take part in this important project, could you and your son or daughter sign the consent forms and bring the forms with you when you come to the interview? If you have any questions, please feel free to call me collect at the phone number above or at home in the evenings after 6:00 p.m. or on the weekend at (703) 953-0546. You’ll get a call from Terry or me to schedule a specific time for the interview (between March 20 and 30). We’ll probably meet at the Communicare Professional Counseling and Treatment Services office at 1072 South Dixie Boulevard, Radcliff, KY.

Sincerely, David Paul Ribbe, M.A., M.S.

David Paul Ribbe
Appendix D-4: Information and Consent Letter to Controls

Dear ________,

Greetings from Virginia! I wonder what you were thinking after our phone conversation on Sunday... Well, let me tell you just a little about what we will be doing when we meet next Monday evening.

Some of the information I would like to obtain involves how young peoples' heart rate and sweat gland activity is affected by a traumatic event. When we talked on the phone, you indicated that you were living in the area four years ago when the Radcliff church bus crash occurred. Some of what we talk about will be about the wreck and how it affected you. The first thing I'll do is ask you to do some simple addition and subtraction problems while your heart rate and sweating rate is measured (sweating is measured by placing two small band-aid-like sensors on your fingertips). Then we'll talk about how you heard about the wreck and how you responded to it. Then you'll mark your answers to some questions about thoughts and feelings that you've had on some questionnaires. After the interview period is over (about an hour and a half), my assistant Terry and I will take some time to sit and chat with you informally. I suspect that you'll have a lot of questions about what I'm doing and what good the information will do--I'll be glad to answer your questions. (Your parents are welcome to come and talk with us, too, if they want to!)

Attached to this letter is a form called "Statement of Informed Consent." Please read it carefully and sign it if you plan to participate in this project. If you plan to take part in this important project, could you sign the consent form and bring it to the interview when you come? Also, I will need your Social Security Number in order to reimburse you $30 for participating. You will receive a check in the mail from Hollins College after the interview.

IMPORTANT! Mike, I need about three more participants for the study before I can come down to Kentucky. May I remind you that I will pay you $10.00 for each additional friend of yours that participates in the study? Only people who lived in Harvin County, Kentucky four years ago (or more) and who were not related to or close friends of anyone who was on the bus can participate. Of course, if you know anyone who was on the bus and they would like to participate, please let me know! People who were not involved in the bus wreck need to be of the same race, sex, and
age as those who were in the wreck. You have already been matched to someone who was on the bus. Specifically, I need one 19 year-old male, one 19-year old female, and one 20 year-old female.

Please write down the names of some friends who match one or more of the descriptions above, and give them a call right away! Please have them call me collect as soon as possible, if they want to participate (they will be paid $30 and $10 for each friend they refer, as well).

If you have any questions, please feel free to call me collect at the phone number above or call me collect at home in the evenings after 6:00 p.m. or on the weekend at (703) 953-0546. You’re scheduled for an interview at 6:00 p.m. Monday, May 25. We will meet you at the Communicare Professional Counseling and Treatment Services office at 1072 South Dixie Boulevard, Radcliff, KY (phone: 351-8166, ask for Dr. Tom Bush). I’m looking forward to meeting you and your friends.

Sincerely,

David Paul Ribbe

David Paul Ribbe, M.A., M.S.
Appendix D-5: Parental Consent Form

Purpose of Project

This project will examine the long-term effects of the Carrollton, Kentucky bus crash that occurred on May 14, 1988. It is primarily concerned with the psychological and physical correlates of a major trauma among adolescents.

Explanation of Project

I understand that my child is voluntarily participating in a research project that is concerned with long-term effects of the crash. The project involves his/her responses to two brief interviews and six questionnaires which will consist primarily of questions about thoughts and feelings that he/she has had about the crash and some questions about other traumatic events. His/her heart rate and sweat gland activity will be measured during the performance of an arithmetic task and during an interview.

I understand that his/her participation will take about 1 1/2 hours. Furthermore, my child may choose to refrain from answering any question or questions, and I or my child may end his/her participation in the study at any time. There will be no negative consequences for withdrawing, should I or my child choose to do so.

Possible Risks, Discomforts, and Benefits

My child may find it emotionally uncomfortable to be reminded of and talk about his/her feelings associated with the crash. While it is unlikely that this discomfort will last a long time after the interview, he/she may have strong feelings in response to his/her participation in the study. I understand that I, too, may experience similar strong feelings in response to my child's participation in the study. It is possible, too, that participating in this study will have positive benefits for my child. He/she may feel some relief from having the opportunity to talk about some of his/her feelings and problems resulting from the crash. He/she may also gain some satisfaction from providing information that may benefit other people who have experienced a traumatic crash. It is important to note, however, that benefits from participating cannot be guaranteed.

Should my child experience any emotional distress during or following the procedures, my child or I may ask either Mr. Ribbe or Ms. Probus to assist us in finding appropriate help from a local clinic such as Communicare (Radcliff or Elizabethtown), Fort Knox Community Mental Health, the Jefferson Center, or from a

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professional in private practice. Psychological assistance may also be obtained at the Psychological Services Center at Virginia Tech, with fees on a sliding scale basis, according to financial need. Within several days of the interview, either Mr. Ribbe or Ms. Probus will call you to ask how your child is doing and to schedule a 1-month follow-up visit to evaluate how he or she is feeling.

Confidentiality

The interviews will be tape-recorded for scoring purposes. Only the principal investigator and trained graduate student assistants will listen to the tapes to determine the accuracy of scoring. No information on the tape will directly reveal your son or daughter's identity. The tape will be erased when scoring is done.

I understand that if my child shares information with the researchers that indicates that he/she may be a danger to him/herself or to others, the researchers will be obligated to notify the proper authorities or individuals directly concerned (including me). Otherwise, all information collected from my child will be kept strictly confidential. Information collected from my child will not be identified with his/her name or any other identifier. He/she will be assigned a number so that no one will know his/her personal responses. I understand that the information is to be used solely for the purposes stated in the first paragraph, and will not be used in any other way without our prior approval.

Consent

I understand that this project has been approved by the Human Subjects Research Committee and the Institutional Review Board at Virginia Polytechnic Institute & State University. Any questions I or my child may have concerning the project can be directed to:

David Paul Ribbe, M.S.  
Principal Investigator  
(703) 231-6581

Helen Crawford, Ph.D.  
Chair, Human Subjects Committee  
(703) 231-6520

Russell T. Jones, Ph.D.  
Project Supervisor  
(703) 231-5934

Linda Probus, M.A.  
Project Facilitator  
(615) 926-1171 ext. 7720

Ernest R. Stout, Ph.D.  
Chair, Institutional Review Board, VA Tech  
(703) 231-9359

If my child has received or is currently receiving professional therapy, informed written consent from his/her therapist will be obtained stating that his/her participation is permissible.

My child and I have both read the above statements and have had an opportunity to ask questions about the study. Any additional questions I or my child may have
concerning the study will also be answered at any time. In addition, I have been provided with a copy of this consent form.

I hereby agree to allow my child to voluntarily participate in the research project described above and under the conditions described above. I am reminded that my child is free to refrain from answering any question(s) or to withdraw from this project at any time, even after signing this form.

Signature of Parent or Guardian

Signature of Witness

Month/Day/Year

Street Address

City

State

ZIP

(Area Code) Phone Number
Appendix D-6: Statement of Informed Consent

Purpose of Project

This project will examine the long-term effects of the Carrolton, Kentucky bus crash that occurred on May 14, 1988. It is primarily concerned with the psychological and physical correlates of a major trauma among adolescents.

Explanation of Project

I understand that I am voluntarily participating in a research project that is concerned with long-term effects of the crash. The project involves my responses to two brief interviews and six questionnaires which will consist primarily of questions about thoughts and feelings that I have had about the crash and some questions about other traumatic events. My heart rate and sweat gland activity will be measured during the performance of an arithmetic task and while answering questions during an interview.

I understand that my participation will take between 1 1/4 to 1 1/2 hours. Furthermore, I may choose to refrain from answering any question or questions, and I may end the interview and/or my participation in the study at any time. There will be no negative consequences for withdrawing, should I choose to do so.

Possible Risks, Discomforts, and Benefits

I may find it emotionally uncomfortable to be reminded of and talk about my feelings associated with the crash. While it is unlikely that this discomfort will last a long time after my interview, I may have strong feelings in response to my participation in this study. It is possible, too, that participating in this study will have positive benefits for me. I may feel some relief from having the opportunity to talk about some of my feelings and problems resulting from the crash. I may also gain some satisfaction from providing information that may benefit other people who have experienced a traumatic crash. It is important to note, however, that benefits from participating cannot be guaranteed.

Should I experience any emotional distress during or following my interviews, I may ask either Mr. Ribbe or Ms. Probus to assist me in finding appropriate help from a local clinic such as Communicare (Radcliff or Elizabethtown), Fort Knox Community Mental Health, the Jefferson Center, or from a professional in private practice. Psychological assistance may also be obtained at the Psychological Services Center at Virginia Tech, with fees on a sliding scale basis, according to financial need. [Minors:
should you request professional assistance, your parent(s) will be notified, and they will assist in locating an appropriate care-giver). Within several days of your interview, either Mr. Ribbe or Ms. Probus will call you to ask how you are doing and to schedule a 1-month follow-up visit to evaluate how you are feeling.

Confidentiality

My interviews will be tape-recorded for scoring purposes. Only the principal investigator and trained graduate student assistants will listen to the tapes to determine the accuracy of scoring. No information on the tape will directly reveal my identity. The tape will be erased when scoring is completed.

I understand that if I share information with the researchers that indicates that I may be a danger to myself or to others, they will be obligated to notify the proper authorities or individuals directly concerned (including my parents). Otherwise, all information collected from me will be kept strictly confidential. Information collected from me will not be identified with my name or any other identifier. I will be assigned a number so that no one will know my personal responses. I understand that the information is to be used solely for the purposes stated in the first paragraph, and will not be used in any other way without my prior approval.

Consent

I understand that this project has been approved by the Human Subjects Research Committee and the Institutional Review Board at Virginia Polytechnic Institute & State University. Any questions I may have concerning the project can be directed to:

David Paul Ribbe, M.S.  
Principal Investigator  
(703) 231-6581

Helen Crawford, Ph.D.  
Chair, Human Subjects Committee  
(703) 231-6520

Ernest R. Stout, Ph.D.  
Chair, Institutional Review Board, VA Tech  
(703) 231-9359

Russell T. Jones, Ph.D.  
Project Supervisor  
(703) 231-5934

Linda Probus, M.A.  
Project Facilitator  
(615) 926-1171 ext. 7720

If I have received or am currently receiving professional therapy, informed written consent from my therapist will be obtained stating that my participation is permissible.

I have read the above statements and have had an opportunity to ask questions about the study. Any additional questions I may have concerning the study will also be answered at any time. In addition, I have been provided with a copy of this statement of informed consent.
I hereby agree to voluntarily participate in the research project described above and under the conditions described above. I am reminded that I am free to refrain from answering any question(s) or to withdraw from this project at any time, even after signing this form.

Signature of Participant

Signature of Witness

Month/Day/Year

Street Address

City

State

ZIP

(Area Code) Phone Number
Appendix D-7: Certificate of Project Participation

I certify that I participated in a research project concerning young people's responses to the Radcliff, KY church bus crash.

Reimbursement

_____ $20.00 for an individual interview

_____ $3.00 each for recruiting additional participants ($5.00 each, if four or more)

_____ TOTAL Reimbursement Due

Name __________________________ Address __________________________

SSN __________________________

Signature ______________________

Date __________________________ Phone __________________________

Witness ________________________  David Paul Ribbe, M.S.
SECTION ONE: Demographics

| Subject Number | _______________ | ___ Bus OR ___ Control |
| Date of Interview | _______________ | Age _______________ |
| Interviewer | _______________ | Gender _______________ |
| Location of Interview | _______________ | Race _______________ |
| Type of Dwelling | _______________ | Primary Language _____ |
| Location of Home | _______________ | Ages of Children _____ |
| Estimated Family Income $ | _____________ | Family Status (self) _____ |
| Religious Preference (Denomination) | | (parents) _____ |

**Highest Grade Completed:** 1 2 3 4 5 6 7 8 9 10 11 12 years of college ___

School grades before and after May, 1988:

**BEFORE**

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<td></td>
<td>Some A' &amp; some B's</td>
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<td></td>
<td>Mostly B's</td>
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<tr>
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<td>Some B's &amp; some C's</td>
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<td>Mostly C's</td>
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<td>Some D's &amp; some F's</td>
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**AFTER**

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<td>Mostly F's</td>
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</tbody>
</table>
PREVIOUS ILLNESS

1. Have you ever been very sick, so sick that you had to go to the hospital or stay home for a long time? If YES, please describe: ____________________________

2. Have you taken prescribed medicine before? What was the name of the medicine?

3. Has there ever been a time when you were having troubles or problems and went to talk to a counselor or doctor about them? Would you mind saying a little bit about the problems? ________________________________

4. Have any other members of your immediate family had troubles or problems and went to talk to a counselor or doctor about them?

   If "YES," who? __________________________

   Briefly describe the nature of the problem(s): ____________________________

   __________________________________________

Did you have medical insurance before May, 1988?  YES  NO
Amount of medical insurance coverage $___________
Estimate the amount of your hospital/medical costs in $__________.
**STRESSFUL LIFE EVENTS**

1. Have you ever experienced one of the following events?

Please check all that apply:  
<table>
<thead>
<tr>
<th>Year</th>
<th>Injury</th>
<th>Damage to home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthquake</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire</td>
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<tr>
<td>Flood</td>
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<tr>
<td>Mudslide</td>
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<tr>
<td>Severe Storm</td>
<td></td>
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<tr>
<td>Toxic Waste</td>
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</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
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</tbody>
</table>

Briefly describe the disaster and your experience:

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

2. Have you ever experienced any events other than the wreck?

Please check all that apply:  
<table>
<thead>
<tr>
<th>Year</th>
<th>Describe Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Injury</td>
<td></td>
</tr>
<tr>
<td>Car Accident</td>
<td></td>
</tr>
<tr>
<td>Getting beat up</td>
<td></td>
</tr>
<tr>
<td>Witness injury to other</td>
<td></td>
</tr>
<tr>
<td>Severe Illness</td>
<td></td>
</tr>
<tr>
<td>Other, such as being strongly affected by someone else's experience</td>
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</tbody>
</table>

Briefly describe the event and your experience (How did it happen?):  

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
SECTION TWO: Trauma Interview

CRASH EXPERIENCE*

*Special instruction for control subjects: Ask "Where were you when you heard about the wreck?" etc.

1. Where were you when the wreck occurred? ____________________________
   ____________________________
   ____________________________

2. What were you doing when it happened? ____________________________
   ____________________________
   ____________________________

3. Who were you with when it happened? ____________________________

4. What did you do after the impact? (Describe step-by-step)
   First, I ____________________________
   Then, I ____________________________
   Then, I ____________________________
   Then, I ____________________________
   Then, I ____________________________
   Then, I ____________________________

5. Were you injured in the crash? YES ____ NO ____ If YES, in what way?
   ____________________________
   ____________________________

6. Degree of Injury │____|____|____|____|____|____|____|
   (Mark with an "X") 1 2 3 4 5 6 7
   NONE MODERATE SEVERE

7. Estimate how close you were to the fire at first: ____ FEET

8. Estimate how close you got to the fire (the closest you got): ____ FEET

9. What do you think caused the wreck? ____________________________
10. How serious did you think the wreck was at first? (Check one response)
   ___ Not Very ___ Somewhat ___ Very

11. How much do you think you could have done to prevent the wreck from happening?
   ___ Not Much ___ Something ___ A Lot

12. How much do you think you could have done to prevent the fire from hurting
    anyone? ___ Nothing ___ Something ___ A Lot

13. How angry are you about the wreck now? ___ None ___ Some ___ A Lot

14. How helpless did you feel during the evacuation of the bus?
   ___ Not at All ___ Somewhat ___ Very Much

15. How helpless do you feel about the crash now?
   ___ Not at All ___ Somewhat ___ Very Much

16. Do you think anyone panicked during the emergency stage? Who? ______________

17. What did they do that made you think they panicked? _________________

18. Did the fire burn something valuable to you? ___ YES ___ NO

   What? 1. ___________________________________________________________________
   2. ___________________________________________________________________
   3. ___________________________________________________________________

19. What was the worst thing caused by the wreck?
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

20. When you knew there was a fire, were you afraid anyone would get hurt?
    Who? ___________________________________________________________________

21. How afraid were you during the crash and evacuation?
   ___ Not at All ___ Somewhat ___ Very Much

22. What were you thinking during the evacuation? ____________________________
   ___________________________________________________________________
PERSONAL LOSS

23. How many friends did you have on the bus? ___
How many of your friends were injured? ___
How many of your friends were killed? ___

24. How close were you to friends that were injured? (Pick the 4 who you knew the best)

FRIEND A

1 2 3 4 5 6 7
| ___ | ___ | ___ | ___ | ___ | ___ | ___ |
Very Distant Average Very Close

FRIEND B

1 2 3 4 5 6 7
| ___ | ___ | ___ | ___ | ___ | ___ | ___ |
Very Distant Average Very Close

FRIEND C

1 2 3 4 5 6 7
| ___ | ___ | ___ | ___ | ___ | ___ | ___ |
Very Distant Average Very Close

FRIEND D

1 2 3 4 5 6 7
| ___ | ___ | ___ | ___ | ___ | ___ | ___ |
Very Distant Average Very Close
25. How close were you to friends that were killed? (Pick the 4 who you knew the best)

FRIEND A

1 2 3 4 5 6 7
|___|___|___|___|___|___|___|
Very Distant Average Very Close

FRIEND B

1 2 3 4 5 6 7
|___|___|___|___|___|___|___|
Very Distant Average Very Close

FRIEND C

1 2 3 4 5 6 7
|___|___|___|___|___|___|___|
Very Distant Average Very Close

FRIEND D

1 2 3 4 5 6 7
|___|___|___|___|___|___|___|
Very Distant Average Very Close
Appendix E-2: DICA-R PTSD Interview

Page 80

[ADOLESCENT]

Coding

NO..........................1
YES...........................2
SOMETIMES OR SOMEWHAT...3
RARELY.......................4

POST-TRAUMATIC STRESS DISORDER:

183. Have you ever had a terrible, really frightening experience? For example, were you ever in danger of being killed or badly hurt?

(PROBE: HAVE YOU EVER HAD YOUR HOUSE AND YOUR POSSESSIONS DESTROYED BY A FLOOD, FIRE OR EARTHQUAKE? WERE YOU THERE WHEN SOMEONE ELSE WAS KILLED OR MURDERED? HAS ANYONE CLOSE TO YOU COMMITTED SUICIDE?)

IF POSITIVE, DESCRIBE:

______________________________

______________________________

IF NO, SKIP TO EATING DISORDERS, Q. 208.
IF YES, CONTINUE:

184. Can you remember how old you were when that happened?

(48 - 49)

Now I'm going to ask you some questions about how you felt after the________(TRAUMATIC EVENT).

185. After the______did you think about it a lot?

(50)

186. Did you think about it even when you tried not to?

(51)

187. After the____did you dream about it over and over?

(52)

188. Did you have a lot of bad dreams about other frightening things?

(53)
189. After the_____ were you ever in a situation where maybe just for a minute or so you felt as if it were happening all over again?

190. Have you ever been really upset because you saw or heard something that reminded you of the______ (TRAUMATIC EVENT)?

191. Have you ever stayed away from things that reminded you of the______ (TRAUMATIC EVENT)?

192. Do you try to stop yourself from thinking about it?

(PROBE: DID YOU TRY TO PUSH THE THOUGHTS OUT OF YOUR HEAD, AND DID YOU GET REALLY UPSET IF THEY DIDN'T GO AWAY?)

193. After the_____ was over, did you ever find that you couldn't remember some things about the______?

(PROBE: LIKE YOU HAD AMNESIA FOR PARTS OF THE______?)

194. After the_____ was over, did you feel that you just couldn't get interested in things that you used to like?

(PROBE: LIKE SPORTS - WATCHING TV, GOING PLACES?)

195. After the_____ did you ever feel that you weren't that interested in what people said or did?
After the ______ did you ever feel that you just couldn't really love anybody; that you really didn't have caring feelings about anyone any more?  (61)

After the ______ do you remember feeling that you had nothing to look forward to in the future?  (62)

(PROBE: THAT YOU WOULDN'T GET MARRIED OR HAVE CHILDREN, AND THAT YOUR LIFE WOULD PROBABLY BE OVER SOON?)

RECORD ____________________________
_______________________________
_______________________________
_______________________________
_______________________________

NOTE TO INTERVIEWER:
IF NO POSITIVES SO FAR IN POST TRAUMATIC STRESS DISORDER, SKIP TO EATING DISORDERS, Q.208.  
IF ANY POSITIVES, CONTINUE:

After the ______ did you find that you were having a lot more trouble than usual either falling asleep or staying asleep?  (63)

After the ______ did you feel very irritable, a lot more than usual?  (64)

Did you lose your temper a lot more than usual?  (65)

After the ______ do you remember the times when you had a great deal of difficulty concentrating a lot more than usual?  (66)
202. Did you feel restless or on edge?

203. Do you remember ever "jumping" when you heard a door slammed, or if someone came up behind you without you realizing it?

204. Did you ever break into a sweat, or feel teary, when you saw something that reminded you of ________?

205. You've told me that you _______ (NAME POSITIVES). How long after ________ did that start? (CODE IN WEEKS: LESS THAN A WEEK = 1 WEEK)

206. How long did they last? (CODE IN MONTHS. LESS THAN 1 MONTH = 1 MONTH)

207. Would you say that this has been a very real problem for you?
Appendix E-3

**DICA-R Summary Sheet**

<table>
<thead>
<tr>
<th>Recorder</th>
<th>VICTIM OR CONTROL</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CRITERION A: Must have a "2" for Event A, B, or C

183. Traumatic Event Occurred (record type of trauma)

<table>
<thead>
<tr>
<th>Event A</th>
<th>Event B</th>
<th>Event C</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______</td>
<td>_______</td>
<td>_______</td>
</tr>
</tbody>
</table>

CRITERION A met?

<table>
<thead>
<tr>
<th>Event A</th>
<th>Event B</th>
<th>Event C</th>
</tr>
</thead>
<tbody>
<tr>
<td>YES NO</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
</tbody>
</table>

CRITERION B: Must have at least 1 of the following symptoms:

<table>
<thead>
<tr>
<th>Event A</th>
<th>Event B</th>
<th>Event C</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______</td>
<td>_______</td>
<td>_______</td>
</tr>
</tbody>
</table>

184 AGE

185 = "2"

186 "RECORD under CRITERION C"

187 = "2"

188

189 = "2"

190 = "2"

CRITERION B met?

<table>
<thead>
<tr>
<th>YES NO</th>
<th>YES NO</th>
<th>YES NO</th>
</tr>
</thead>
</table>

CRITERION C: Must have at least 3 of the following symptoms:

<table>
<thead>
<tr>
<th>Event A</th>
<th>Event B</th>
<th>Event C</th>
</tr>
</thead>
<tbody>
<tr>
<td>_______</td>
<td>_______</td>
<td>_______</td>
</tr>
</tbody>
</table>

186 = "2"

191 = "2"

192

193 = "2"

194 = "2"

195 = "2"

196 = "2"

197 = "2"

CRITERION C met?

<table>
<thead>
<tr>
<th>YES NO</th>
<th>YES NO</th>
<th>YES NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRITERION D: Must have at least 2 of the following symptoms:</td>
<td>Event A</td>
<td>Event B</td>
</tr>
<tr>
<td>-------------------------------------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>198 = &quot;2&quot;</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>199 or 200 = &quot;2&quot;</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>201 = &quot;2&quot;</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>202 = &quot;2&quot;</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>203 = &quot;2&quot;</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>204 = &quot;2&quot;</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>CRITERION D met?</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CRITERION E: 01 months or more</th>
<th>Event A</th>
<th>Event B</th>
<th>Event C</th>
</tr>
</thead>
<tbody>
<tr>
<td>205 Latency of onset</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>206 = &quot;01 or more&quot;</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>207 Very real problem</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>CRITERION E met?</td>
<td>YES NO</td>
<td>YES NO</td>
<td>YES NO</td>
</tr>
</tbody>
</table>

PTSD DIAGNOSIS: Must meet all 5 criteria: A,B,C,D, and E

| # Symptoms (B+C+D)                                           | --------| --------| --------|
| # Criteria (A+B+C+D+E)                                       | --------| --------| --------|
| PTSD?                                                       | YES NO | YES NO | YES NO |
Appendix E-4: DICA-R Behavioral Observations

Page 104

ADOLESCENT

OBSERVATIONS

NOTE TO INTERVIEWER: DO NOT FILL OUT IN PRESENCE OF CHILD

275. A. General appearance

(1) Does he act his age?

YES.................................1

WOULD MISTAKE HIM FOR YOUNGER CHILD...2

WOULD MISTAKE HIM FOR AN OLDER CHILD...3

(22)

(2) Is he appropriately and cleanly dressed?

YES.................................1

DIRTY AND UNKEMPT....................2

AGE INAPPROPRIATE....................3

ODD, BIZARRE..........................4

OTHER:__________________________5

(23)

(3) General air, pervasive attitude is:

OPEN AND FRIENDLY

OR SHY BUT WARMS UP..................1

HOSTILE AND SUSPICIOUS................2

EXCESSIVELY SHY, WITHDRAWN,

ANXIOUS OR SCARED....................3

BLASE, OVERCONFIDENT................4

OTHER:__________________________5

(24)

(4) State of nutrition:

AVERAGE, LOOKS WELL-FED...............1

UNDERNOURISHED AND/OR EXTREMELY THIN...2

OVERWEIGHT OR OBSESE..................3

THIN, BELOW AVERAGE, BUT NOT

UNDERNOURISHED....................4

CHUBBY, BUT APPEARS NORMAL FOR AGE.....5

(25)

(5) Facial expression (pattern during interview)

NATURAL AND UNREMARKABLE...........1

EXPRESSIONLESS, NO VARIATION

WITH THOUGHT CONTENT..................2

ANXIOUS AND WORRIED..................3

SAD, TEARFUL OR CRYING, DEPRESSED...4

HOSTILE, ANGRY (FROWNS, POUTS).........5

HIDES FACE FROM VIEW

(AVOIDS EYE CONTACT)................6

FLUCTUATED MARKEDLY DURING INTERVIEW...7
B. Affect

SHOWS FEELINGS APPROPRIATE TO CONTENT OF THOUGHT AND SITUATION.  ............. 1
INAPPROPRIATELY SAD, ELATED, SILLY OR HOSTILE.  ......................... 2
UNUSUALLY FLAT, DISTANT, COLD.  ......................... 3
OTHER:  ........................................ 4

C. Motor Behavior

SITS OR STANDS WITH NORMAL AMOUNT OF MOVEMENT.  ................. 1
OVERACTIVE, IN OR OUT OF CHAIR.  ................. 2
REPETITIVE, STEREOTYPED MOVEMENTS.  ................. 3
BIZARRE, PURPOSELESS OR UNUSUAL MOVEMENTS, NOT NECESSARILY REPETITIVE.  4
SITS OR STANDS STIFF, RIGID, TENSE.  ................. 5
TICS.  ........................................ 6
OTHER:  ........................................ 7

D. Speech

(1) General description

NORMAL, INTELLIGIBLE, APPROPRIATE AMOUNT.  ................. 1
EXCESSIVE AMOUNT, CONSTANT.  ......................... 2
REDUCED AMOUNT, ANSWERS QUESTIONS WITH AS FEW WORDS AS POSSIBLE.  3
OTHER:  ........................................ 4

(2) Pattern

REGULAR, SMOOTH, EVEN.  ......................... 1
POOR ARTICULATION (LISPING, SLURRING, "BABY TALK," DIFFICULTY WITH CONSONANTS, ETC.), 2
STUTTERING, STAMMERING.  ......................... 3
INTERMITTENT, UNUSUAL SOUNDS, EXPLETIVES, GRUNTS, BARKS, ETC.  ................. 4
OTHER:  ........................................ 5

E. Attention

NORMAL ATTENTION FOR AGE.  ......................... 1
INATTENTIVE, EASILY DISTRACTED.  ......................... 2
OTHER:  ........................................ 3
F. Flow of thought

RELEVANT, COHERENT, NORMAL...............1
THOUGHTS SEEMS TO RACE
CAUSING PUSHE OF SPEECH..................2
THINKING PROCESS IS SLOW
WITH SLOW RESPONSES....................3
PERSERVATION (REPEATS WORDS
OR PHRASES).............................4
CIRCUMSTANTIAL AND/OR IRRELEVANT......5
DIFFICULT TO FOLLOW.......................6
DOESN'T MAKE SENSE.......................7
MORE THAN ONE ABOVE (CIRCLE)...........8

G. General response to interview

NO SPECIAL PROBLEMS.
COOPERATIVE, ADEQUATE EFFORT...........1
SHOWED PERSISTENT, EXCESS ANXIETY
RELATED TO INTERVIEW OR OVER-CONCERN
ABOUT "RIGHT ANSWERS"....................2
EXCESS USE OF FANTASY OR
CONFABULATION...........................3
GAVE UP EASILY, DID NOT TRY.............4
OPEN DISGUST AND LACK OF COOPERATION...5
HAD TO BE COAXED CONTINUALLY...........6
TIRED EASILY, WANTED TO STOP, BUT
KEPT ON WITH ENCOURAGEMENT...............7
QUIT AND REFUSED TO GO ON...............8

H. Clinical impressions from the interview:

-----------------------------------------------------------------------------------
-----------------------------------------------------------------------------------
-----------------------------------------------------------------------------------
-----------------------------------------------------------------------------------
-----------------------------------------------------------------------------------
Appendix E-4: Behavioral Observations

Subject Number ____

275. A. GENERAL APPEARANCE
   1. ____
   2. ____
   3. ____
   4. ____
   5. ____

B. AFFECT

C. MOTOR BEHAVIOR

D. SPEECH
   1. ____
   2. ____

E. ATTENTION

F. FLOW of THOUGHT

G. GENERAL RESPONSE
to INTERVIEW

H. CLINICAL IMPRESSION from the INTERVIEW
### FREDERICK REACTION INDEX (ADULT)

**Subject #**

Please answer each question by placing a check mark under the item which best describes your feelings. Please be sure to answer all questions.

<table>
<thead>
<tr>
<th>Question</th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>Much of the time</th>
<th>Most of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I believe my exposure to _ was an extreme stressor that could cause emotional problems in most people.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Fears of personal experiences with the ____ continue in my mind.</td>
<td></td>
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</tr>
<tr>
<td>3. I re-experience disturbing scenes about the __ physically or emotionally.</td>
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</tr>
<tr>
<td>4. Uncomfortable thoughts about my experiences in ____ seem to invade my mind in spite of my efforts to keep them out.</td>
<td></td>
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<tr>
<td>5. Dreams about my ____ experience keep coming back.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6. I see or think of something that makes me feel as if my ____ experience could happen again.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>7. I keep an interest in activities that were important before __ such as sports (e.g. bowling, golf, going to football games, etc.) or playing cards with a group, reading, going to movies.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>8. Fears about the ____ have left me numb and emotionally unfeeling.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

146
<table>
<thead>
<tr>
<th></th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>Much of the time</th>
<th>Most of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. I am now more detached and less involved with other people than I was before the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I express emotions and feelings as freely as I did before the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. I am jumpy, edgy, and more easily startled than before the</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12. I sleep well.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I feel bad or guilty that I did not do more to try to prevent what happened or that I went through less than others.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. I remember things as well as I did before it happened.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. My concentration is as good as it was before.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. I tend to avoid activities which might make me remember my experiences.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. When something resembles or reminds me of it, I have such reactions as a dry mouth, clammy hands, and a change in breathing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. Certain sounds, odors, or sights make my heart race or my stomach tighten.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. I am relaxed and without tension when I think of</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>None of the time</td>
<td>A little of the time</td>
<td>Some of the time</td>
<td>Much of the time</td>
<td>Most of the time</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-----------------</td>
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<td>-----------------</td>
</tr>
</tbody>
</table>

20. It is as easy for me to make my decisions as it was before the __________. 

**PLEASE ANSWER YES OR NO TO THE FOLLOWING**

21. Symptoms of distress began within 6 months of the time I was exposed to _____.

22. If yes, did the last of these symptoms disappear within 6 months following _____.

23. Were any symptoms of distress present for more than 6 months following _____.

24. Have you noticed any symptoms which were delayed and appeared at least 6 months after your exposure to _____.

25. Have you ever talked with a crisis worker or received any professional assistance resulting from the _____.

26. If yes, circle the letters noted for all areas which apply.
   a. Medicine
   b. Psychological
   c. Pastoral (Religion)
   d. Social Welfare
   e. Financial (Loans, Housing, Property Loss)

*Whenever _____ appears the applicable traumatic term is used e.g. "combat", "flood", "battering", "injury", "airplane crash", etc.

**REACTION INDEX Scale**

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Appendix E-6

IMPACT OF EVENT SCALE

On __________, you experienced _____________________________.

(date) (life event)

Below is a list of comments made by people after stressful life events. Please check each item, indicating how frequently these comments were true for you DURING THE PAST SEVEN DAYS. If they did not occur during that time, please mark the "not at all" column.

<table>
<thead>
<tr>
<th>FREQUENCY</th>
<th>Not at All</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I thought about it when I didn't want to.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I avoided letting myself get upset when I thought about it or was reminded of it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I tried to remove it from memory.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I had trouble falling asleep or staying asleep because pictures or thoughts of it came into my mind.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I had waves of strong feelings about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. I had dreams about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. I stayed away from reminders of it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I felt as if it hadn't happened or it wasn't real.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I tried not to talk about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Pictures about it popped into my mind.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Other things kept making me think about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. I was aware that I still had a lot of feelings about it, but I didn't deal with them.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I tried not to think about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Any reminder brought back feelings about it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. My feelings about it were kind of numbed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BECK INVENTORY

On this questionnaire are groups of statements. Please read each group of statements carefully. Then pick out the one statement in each group which best describes the way you have been feeling the PAST WEEK, INCLUSIVE OF TODAY! Circle the number beside the statement you picked. If several statements in the group seem to apply equally well, circle each one. Be sure to read all the statements in each group before making your choice.

1 0 I do not feel sad.
   1 I feel sad.
   2 I am sad all the time and I can't snap out of it.
   3 I am so sad or unhappy that I can't stand it.

2 0 I am not particularly discouraged about the future.
   1 I feel discouraged about the future.
   2 I feel I have nothing to look forward to.
   3 I feel that the future is hopeless and that things cannot improve.

3 0 I do not feel like a failure.
   1 I feel I have failed more than the average person.
   2 As I look back on my life, all I can see is a lot of failures.
   3 I feel I am a complete failure as a person.

4 0 I get as much satisfaction out of things as I used to.
   1 I don't enjoy things the way I used to.
   2 I don't get real satisfaction out of anything anymore.
   3 I am dissatisfied or bored with everything.

5 0 I don't feel particularly guilty.
   1 I feel guilty a good part of the time.
   2 I feel quite guilty most of the time.
   3 I feel guilty all of the time.

6 0 I don't feel I am being punished.
   1 I feel I may be punished.
   2 I expect to be punished.
   3 I feel I am being punished.

7 0 I don't feel disappointed in myself.
   1 I am disappointed in myself.
   2 I am disgusted with myself.
   3 I hate myself.

8 0 I don't feel I am any worse than anybody else.
   1 I am critical of myself for my weaknesses or mistakes.
   2 I blame myself all the time for my faults.
   3 I blame myself for everything bad that happens.

9 0 I don't have any thoughts of killing myself.
   1 I have thoughts of killing myself, but I would not carry them out.
   2 I would like to kill myself.
   3 I would kill myself if I had the chance.

10 0 I don't cry any more than usual.
    1 I cry more now than I used to.
    2 I cry all the time now.
    3 I used to be able to cry, but now I can't cry even though I want to.

11 0 I am no more irritated now than I ever was.
    1 I get annoyed or irritated more easily than I used to.
    2 I feel irritated all the time now.
    3 I don't get irritated at all by the things that used to irritate me.

12 0 I have not lost interest in other people.
    1 I am less interested in other people than I used to be.
    2 I have lost most of my interest in other people.
    3 I have lost all of my interest in other people.

13 0 I make decisions about as well as I ever could.
    1 I put off making decisions more than I used to.
    2 I have greater difficulty in making decisions than before.
    3 I can't make decisions at all anymore.

14 0 I don't feel I look any worse than I used to.
    1 I am worried that I am looking old or unattractive.
    2 I feel that there are permanent changes in my appearance that make me look unattractive.
    3 I believe that I look ugly.

15 0 I can work about as well as before.
    1 It takes an extra effort to get started at doing something.
    2 I have to push myself very hard to do anything.
    3 I can't do any work at all.

16 0 I can sleep as well as usual.
    1 I don't sleep as well as I used to.
    2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
    3 I wake up several hours earlier than I used to and cannot get back to sleep.

17 0 I don't get more tired than usual.
    1 I get tired more easily than I used to.
    2 I get tired from doing almost anything.
    3 I am too tired to do anything.

18 0 My appetite is no worse than usual.
    1 My appetite is not as good as it used to be.
    2 My appetite is much worse now.
    3 I have no appetite at all anymore.

19 0 I haven't lost much weight, if any, lately.
    1 I have lost more than 5 pounds by eating less. Yes, No.
    2 I have lost more than 10 pounds by eating less.
    3 I have lost more than 15 pounds.

20 0 I am no more worried about my health than usual.
    1 I am worried about physical problems such as aches and pains; or upset stomach; or constipation;
    2 I am very worried about physical problems and it's hard to think of much else.
    3 I am so worried about my physical problems that I cannot think about anything else.

21 0 I have not noticed any recent change in my interest in sex.
    1 I am less interested in sex than I used to be.
    2 I am much less interested in sex now.
    3 I have lost interest in sex completely.

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**SELF-EVALUATION QUESTIONNAIRE**

Developed by Charles D. Spielberger
in collaboration with
R. L. Gorsuch, R. Lushene, P. R. Vagg, and G. A. Jacobs

**STAI Form Y-1**

Name __________________________ Date __________ S __________
Age ________ Sex: M ______ F ______

**DIRECTIONS:** A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel right now, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Not At All</th>
<th>Slightly</th>
<th>Moderately</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I feel calm</td>
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<tr>
<td>2. I feel secure</td>
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<tr>
<td>3. I am tense</td>
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<tr>
<td>4. I feel strained</td>
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<td>5. I feel at ease</td>
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<td>6. I feel upset</td>
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<tr>
<td>7. I am presently worrying over possible misfortune</td>
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<tr>
<td>8. I feel satisfied</td>
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<tr>
<td>9. I feel frightened</td>
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<td>10. I feel comfortable</td>
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<td>11. I feel self-confident</td>
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<tr>
<td>12. I feel nervous</td>
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<tr>
<td>13. I am jitter</td>
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<td>14. I feel indecisive</td>
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<tr>
<td>15. I am relaxed</td>
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<tr>
<td>16. I feel content</td>
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<tr>
<td>17. I am worried</td>
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<tr>
<td>18. I feel confused</td>
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<tr>
<td>19. I feel steady</td>
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<tr>
<td>20. I feel pleasant</td>
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SELF-EVALUATION QUESTIONNAIRE
STA1 Form Y-2

Name ____________________________ Date ____________

DIRECTIONS: A number of statements which people have used to
describe themselves are given below. Read each statement and then
blacken in the appropriate circle to the right of the statement to in-
dicate how you generally feel. There are no right or wrong answers. Do
not spend too much time on any one statement but give the answer
which seems to describe how you generally feel.

21. I feel pleasant ........................................... 0 0 0 0

22. I feel nervous and restless ......................... 0 0 0 0

23. I feel satisfied with myself ........................... 0 0 0 0

24. I wish I could be as happy as others seem to be 0 0 0 0

25. I feel like a failure ...................................... 0 0 0 0

26. I feel rested .............................................. 0 0 0 0

27. I am "calm, cool, and collected" ................. 0 0 0 0

28. I feel that difficulties are piling up so that I cannot overcome them 0 0 0 0

29. I worry too much over something that really doesn't matter 0 0 0 0

30. I am happy ............................................... 0 0 0 0

31. I have disturbing thoughts ........................... 0 0 0 0

32. I lack self-confidence ................................. 0 0 0 0

33. I feel secure ............................................ 0 0 0 0

34. I make decisions easily ............................... 0 0 0 0

35. I feel inadequate ...................................... 0 0 0 0

36. I am content ........................................... 0 0 0 0

37. Some unimportant thought runs through my mind and bothers me 0 0 0 0

38. I take disappointments so keenly that I can't put them out of my mind 0 0 0 0

39. I am a steady person .................................. 0 0 0 0

40. I get in a state of tension or turmoil as I think over my recent concerns and interests 0 0 0 0

152
Please answer each question by placing a check mark under the item which best describes your feelings. Please be sure to answer all questions.

<table>
<thead>
<tr>
<th></th>
<th>Very</th>
<th>Little</th>
<th>A Little</th>
<th>Some</th>
<th>Much</th>
<th>Very Much</th>
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</thead>
<tbody>
<tr>
<td>1. It is important to me not to appear nervous</td>
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<tr>
<td>2. When I cannot keep my mind on a task, I worry that I might be going crazy</td>
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<tr>
<td>3. It scares me when I feel 'shaky' (trembling)</td>
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<td>4. It scares me when I feel faint</td>
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<td>5. It is important to me to stay in control of my emotions</td>
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<td>6. It scares me when my heart beats rapidly</td>
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<td>7. It embarrasses me when my stomach growls</td>
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<td>8. It scares me when I am nauseous</td>
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<td>9. When I notice that my heart is beating rapidly, I worry that I might have a heart attack</td>
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<td>10. It scares me when I become short of breath</td>
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<td>11. When my stomach is upset, I worry that I might be seriously ill</td>
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<td>12. It scares me when I am unable to keep my mind on a task</td>
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<tr>
<td></td>
<td>Very Little</td>
<td>A Little</td>
<td>Some</td>
<td>Much</td>
<td>Very Much</td>
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<tr>
<td>13. Other people notice when I feel shaky</td>
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<tr>
<td>14. Unusual body sensations scare me</td>
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<tr>
<td>15. When I am nervous, I worry that I might be mentally ill</td>
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<tr>
<td>16. It scares me when I am nervous</td>
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</tbody>
</table>

**ANXIETY FREQUENCY CHECKLIST© 1986**

Please answer each question by placing a check mark under the item which best describes how frequently you experience the following symptoms. Please be sure to answer all questions.

<table>
<thead>
<tr>
<th></th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Often</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rapid (pounding) heart beat</td>
<td></td>
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<tr>
<td>2. Trembling</td>
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<tr>
<td>3. Nervousness</td>
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<tr>
<td>4. Feeling faint</td>
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<tr>
<td>5. Nausea</td>
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<tr>
<td>6. Shortness of breath</td>
<td></td>
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<tr>
<td>7. Unusual body sensations</td>
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<tr>
<td>8. Inability to keep mind on task</td>
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<tr>
<td>9. Diarrhea</td>
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</table>
FSS

Below are 52 different stimuli which can cause fear in people. Please indicate how much fear you feel using the following rating scale and record your answer in the space provided:

1 = None  
2 = Very little fear  
3 = A little fear  
4 = Some fear  
5 = Much fear  
6 = Very much fear  
7 = Terror

1. Sharp Objects  
2. Being a passenger in a car  
3. Dead bodies  
4. Suffocating  
5. Failing a test  
6. Looking foolish  
7. Being a passenger in an airplane  
8. Worms  
9. Arguing with parents  
10. Worms  
11. Life after death  
12. Hypodermic needles  
13. Being criticized  
14. Meeting someone for the first time  
15. Roller coasters  
16. Being alone  
17. Making mistakes  
18. Being misunderstood  
19. Death  
20. Being in a fight  
21. Crowded places  
22. Blood  
23. Heights  
24. Being a leader  
25. Swimming alone  
26. Illness  
27. Being with drunks  
28. Illness or injury to loved ones  
29. Being self-conscious  
30. Driving a car  
31. Meeting authority  
32. Mental illness  
33. Closed places  
34. Boating  
35. Spiders  
36. Thunderstorms  
37. Not being a success  
38. God  
39. Snakes  
40. Cemeteries  
41. Speaking before a group  
42. Seeing a fight  
43. Death of a loved one  
44. Dark places  
45. Strange dogs  
46. Deep water  
47. Being with a member of the opposite sex  
48. Stinging insects  
49. Untimely or early death  
50. Losing a job  
51. Auto accidents  
52. Fire, being burned
Appendix E-11: Hollingshead SES

Subject # __

1. Who provides the financial support for the household in which you live?
   A. Two parents, step-parents, or guardians both employed
   B. One employed parent, step-parent, or guardian
   C. The pension, estate, or support payments of one parent, step-parent, or legal guardian
   D. Other (unemployment benefits, etc.)

Determine education level and occupation of:
   1.A.: Both parents, step-parents, or guardians
   1.B., C., or D.: Parent, step-parent, or guardian who provides support, or whose pension, estate, or benefits provide support.

2. What level of education did the supporter(s) complete?
   A. Less than seventh grade
   B. Junior High School (9th grade)
   C. Partial High School
   D. High School Graduate
   E. Partial College or Vocational Training
   F. College Degree
   G. Graduate Degree

3. What is the current (or most recent) occupation of the supporter(s)? Be SPECIFIC

__________________________________________________________________________________________________________________________________________
Appendix F: Case Studies

Due to the small sample size, findings in this study have limited generalizability to the larger population of adolescent accident victims. Nevertheless, data collected from this particular sample are rich in descriptive detail. Therefore, individual cases of four select survivors are summarized below to provide useful insights into the clinical presentation of participating survivors and to generate heuristics for future research. The survivors who are profiled below represent four logical combinations of assessment outcomes: 1) low levels of self-reported stress symptoms with a reactive HR profile; 2) low levels of self-reported stress symptoms with an non-reactive HR profile; 3) high levels of self-reported stress symptoms with a reactive HR profile; and 4) high levels of self-reported stress symptoms with an non-reactive HR profile.

Individual cases are presented with a summary of demographic characteristics first, followed by a brief verbatim description of the individual’s experience immediately before, during, and after the crash. Summaries of the participant’s PTSD symptom pattern and his or her self-reported symptomatology on other stress-related measures follow. Individual HR graphs supplement a brief description of the participant’s HR pattern (HR graphs are presented in Appendix G). Each case concludes with a short, speculative conceptualization of factors that may have influenced the symptom patterns expressed by the individual.

**Low Symptoms, Reactive HR**

**Survivor 01** was a 20 year-old single African-American female who graduated from high school and completed half a year of college. She was 16 years old at the time of the crash. She reported that she was dozing in the middle section of the bus when the collision occurred. She woke immediately and heard screaming. She was amnesic for details about how she got off the bus. She remembered being calmed by two other girls and feeling very helpless after the crash. She had five friends on the bus, two of whom were injured, and one was killed. She worried about her younger brother who was also on the bus until she found him 15 to 20 minutes after the crash. She suffered second-degree burns which she indicated were moderate in terms of severity. Her brother was "badly burned."

Shortly after the diagnostic interview began, she began crying. On the DICA-R, she reported a total of eight PTSD symptoms that lasted at least 12 months following
the wreck; one intrusion symptom (upset by reminders of the wreck), two avoidance symptoms (avoiding things associated with the wreck and amnesia for details of the wreck), and five increased arousal symptoms (all but trouble falling/staying asleep). She did not meet the diagnostic criteria for PTSD due to lack of a third avoidance symptom. At the time of the interview, she reported that she had experienced the intrusion and avoidance symptoms and one arousal symptom within the past month. The interviewer noted that she appeared to discount the severity of symptoms.

On the RI, she obtained a score of 23, placing her in the mild trauma range on Pynoos and Nader's (1988) and Frederick's (1988) scales of severity. She endorsed no symptoms on the IES, obtaining a score of zero. On the BDI, she scored 5, which is in the low range. On the STAI, she obtained a score of 32 on the state anxiety scale and 37 on the trait anxiety scale, which are below clinical levels. Of note, on the Anxiety Sensitivity Index, she endorsed only three items; "It is important to me to stay in control of my emotions," "It scares me when I am unable to keep my mind on a task," and "Other people notice when I feel shak[y]." On the Anxiety Frequency Checklist, she endorsed rapid (pounding) heart beat, inability to keep mind on task, and diarrhea.

Of note, this participant’s HR showed a great deal of variability, ranging more than 25 bpm across assessment periods. She appeared to be particularly reactive to the MA task, the end of the demographic questions, and the consequences portion of the crash interview.

Despite the low scores on the paper-and-pencil assessment instruments, it appears that this participant was still affectively and physiologically reactive to reminders of the bus wreck. It is possible that current symptomatology was under-reported by this individual as a means of avoiding further activation of distressing thoughts and affects related to the wreck.

**Low Symptoms, Non-reactive HR**

**Survivor 03** was a single, 17 year-old white male in the eleventh grade who was 13 years old at the time of the wreck. He reported that he was lying on the floor at the fourth seat back on the right side of the bus. He remembered feeling the bus swerve, heard the impact, and felt it "a bit." He heard everybody yelling, then he recalls pushing his friend toward the back of the bus where he was pulled out. He remembered thinking that he shouldn’t breathe the hot air. At this point, he reported a
"memory lapse." He remembered running to the median, where he began coughing a lot. He received a "slight" burn and was treated for smoke inhalation. He reported that he had ten friends on the bus, four of whom were injured and five were killed.

On the DICA-R, he reported a total of eight PTSD symptoms that persisted for at least three months following the wreck. He endorsed two intrusion symptoms (thinking about the wreck a lot, and upset by reminders of the wreck), four avoidance symptoms (thinking about the wreck when trying not to, avoiding things associated with the wreck, amnesia for details of the wreck, and loss of interest in people), and two arousal symptoms (trouble falling/staying asleep, and decreased attention). Only the second and third avoidance symptoms were current. The interviewers noted that he appeared to be reserved, emotionally flat, detached from the interview, and eager to leave. He fidgeted a lot during the interview, crossing and shaking his legs when asked probe questions about his symptoms. His verbal responses were brief and not spontaneous.

On the RI, the participant obtained a score of 31, indicating moderate trauma according to both severity classifications. He scored 10 on the IES (zero on the intrusion subscale, and 10 on the avoidance subscale), which is low compared to Horowitz' stress sample norms. He endorsed only two items, both as "often" ("I avoided letting myself get upset when I thought about it or was reminded of it" and "I stayed away from reminders of it"). On the BDI, he scored in the low range with a score of 6. He acknowledged a relatively elevated level of state anxiety on the STAI (41), and lower than average trait anxiety (28). The two outlying responses on the ASI were the items "It is important to me not to appear nervous," and "It is important to me to stay in control of my emotions." On the AFC, the only item he endorsed was "inability to keep mind on task."

What is remarkable about this participant's HR profile is that it is very flat, with very little variability across periods. It does not show clear reactivity to changes in tasks, nor habituation across the session. Also of note, he showed little increase in HR during the MA task—he also was the only individual to answer all the MA problems correctly.

The predominance of current positive avoidance symptoms (conscious efforts to avoid thoughts, behaviors, and affects that elicit memories of the trauma) relative to other symptoms suggest that this participant may have been engaging avoidance behaviors as a current defense against distressing memories of the wreck. His
affective expression and his relatively flat HR responses suggest that avoidance, or psychic numbing responses may have a concomitant suppressing effect on autonomic activity.

**High Symptoms. Reactive HR**

**Survivor 09** was a 19 year-old, single, white male who was in the first semester of college. He was 15 years old at the time of the wreck. He was sitting in the third seat from the front talking with a friend when the wreck occurred. He heard his friend yell, then he looked up, then he hit the seat in front of him on impact with the pick-up truck. He was aware of the bus sliding, then saw the fire start. He heard screaming as he began to climb over seats. He recalled thinking that he had to get out of the bus as he yelled and screamed himself. He dove for the emergency door and was pulled through by someone outside. He escaped with minor scrapes and burns. Of the three friends he knew on the bus, two were injured, and one was killed.

This participant’s responses to the DICA-R PTSD interview indicated a very high level of PTSD symptomatology. He reported 15 PTSD symptoms that persisted for at least two years following the wreck. The only symptoms that he did not endorse were: 1) changed outlook on the future; and 2) increased startle reflex. He reported that he currently thinks about the wreck a lot, avoids things associated with the wreck, has amnesia for details of the wreck, and has experienced a loss of interest in people. While he did not meet the diagnostic criteria for current PTSD, he reported the second highest number of current PTSD symptoms of the survivor group. During the interview, he did not appear to exhibit signs of distress. According to the interviewers, he was bright, cooperative, personable, and verbal.

His responses on the paper-and-pencil assessment instruments reflected mixed levels of stress-related symptomatology. He obtained an RI score of 31, which placed him in the moderate trauma range on both severity classifications. He endorsed all but four of the RI items. On the IES, he obtained a score of 24 ($\bar{x} = 1.6$), which was high relative to his survivor counterparts. His BDI totaled 4, indicating a low level of depressive symptomatology. He reported relatively low levels of state and trait anxiety on the STAI (23 and 33, respectively, both of which are below clinical levels of anxiety). On the ASI, he obtained a score of 15, which was higher than all but two of the other survivors’ responses. On the AFC, he acknowledged experiencing nervousness, shortness of breath, and inability to keep his mind on task.
Visual inspection of the this participant’s HR response pattern reveals highly variable HR activity. His HR varied by as much as 26 beats per minute. Reactivity to the MA task showed the greatest contrast. The profile reveals habituation within periods, and across periods with a tendency to return to baseline. Both the BCQ demographic interview, and the initial portion of the BCQ crash interview elicited increases in HR.

This participant’s past and current self-reported PTSD and stress-related symptomatology appear to be consistent with a reactive HR profile. His past and current symptomatology could be explained from a neuro-biological perspective. It may be that he had a particularly labile autonomic nervous system which predisposed him to high levels of arousal, which in turn, maintained distressing subjective symptoms. Of note, this participant reported that he had witnessed another individual be shot in the leg at a party just days before the interview. Although he reported only one PTSD symptom in connection with the shooting, it may also be that the increased distress associated with witnessing the shooting potentiated his feelings of distress associated with the wreck.

**High Symptoms, Non-reactive HR**

**Survivor 21** was a 16 year-old single, white female who was in the 10th grade. She was 12 years old at the time of the wreck. She had been sitting in the third seat from the back on the driver’s side of the bus, trying to sleep when she saw the oncoming pick-up truck before the impact. She then saw flames by the door of the bus and heard someone shout "Get out!" She remembered that she stood up, then "passed out." The next thing she remembered was someone throwing her onto the concrete highway from the bus. She cracked her kneecap in the fall. A woman who was traveling on the highway came to her and started talking to her and helping her. She recalled wondering if she was going to die, who would tell her parents, and who would go through her room at home if she died. She remembered helicopters coming to take the injured to the hospital. The trip to the hospital was confusing and frightening to her because she did not know who was alive and who had died. Of the 25 friends she knew on the bus, 15 were injured and 7 were killed. She was treated for injuries to her kneecap and for minor burns on her leg.

This participant reported a total of 13 PTSD symptoms on the DICA-R, including all the intrusion symptoms, three avoidance symptoms, and all of the
increased arousal symptoms. She clearly met the diagnostic criteria for PTSD during the time immediately following the wreck. She acknowledged that she was still experiencing most of the symptoms currently, and that they were still "a very real problem" for her.

On the paper-and-pencil assessment instruments, this participant acknowledged high levels of current distress. On the RI, this participant endorsed all but one item (keeping interest in activities that were important before the wreck). She obtained a score of 60 out of a possible 80, indicating "severe" and "very severe" trauma according to both severity classifications. On the IES, she endorsed every item, obtaining a score of 45 ($x = 3.0$) out of a possible 65. Her intrusion subscale score was 29 out of a possible 35 ($x = 4.14$), and her avoidance subscale score was 16 out of a possible 40 ($x = 2.0$). These scores are consistent with those of individuals who have experienced a significant trauma. Her BDI score was 17, indicating what may be a clinical level of depressive symptoms. She reported high levels of state and trait anxiety, scoring 51 and 49, respectively on the STAI subscales. On the ASI, she endorsed every symptom except two ("When I notice that my heart is beating rapidly, I worry that I might have a heart attack" and "When my stomach is upset, I worry that I might be seriously ill."). On the AFC, she endorsed every item as "sometimes" or "often" with the exception of diarrhea.

This participant's HR profile appeared to be unremarkable. Upon visual examination, her pattern of physiological reactivity and habituation showed relatively little variability, and an expected pattern of HR elevations at the beginning of every new task period followed by habituation and return to baseline.

Of particular interest, this young participant endorsed far more PTSD symptoms and reported much higher levels of psychological distress than did the other participating survivors. Affectively, she appeared to be calm and in no apparent distress. Also of note, this participant's parents were both involved with a well-known national organization that lobbies against drunk driving. In fact, her father became the president of the organization following the wreck. All three of them (mother, father, and survivor) regularly traveled around the United States giving speeches about the negative consequences of drunk driving. A possible explanation for the discrepancy in self-reported symptomatology and in observable affective expression and HR reactivity may be that the participant had adopted a trauma response set, shaped in part by
parental expectations, and the demands of talking in public about the negative impact of drunk driving.

**Summary and Conclusions**

Survivors in this sample of bus crash victims exhibited varying patterns of symptomatology in response to the structured diagnostic interview, the self-report paper-and-pencil assessment instruments, and psychophysiological measures. While no consistent pattern of responding emerged among the participants in this sample, examination of individual response patterns in light of individual situational factors elicited several hypotheses about the course and severity of symptoms and highlighted some issues that might be appropriate targets for clinical intervention. In the first case study, the participant appeared to be experiencing greater distress than she acknowledged, as indicated by her crying behavior and high level of HR reactivity. It may be that her efforts to deny the severity or intensity of symptoms served to maintain affective and physiological responses to reminders of the crash in a manner similar to Mowrer’s two-factor theory. Clinical intervention, in this participant’s case, might target the emotional and physiological reactivity through by means of re-exposure techniques (e.g., imaginal flooding, graduated exposure to wreck-related stimuli, etc.) (Foa et al., 1989).

In the second case, the participant appeared to be affectively, physiologically, and subjectively numbed. This response may have been the downswing of a cycle between intrusive symptomatology and numbing symptomatology (Horowitz, 1989). Obviously, such a cycling pattern could be determined only by repeated follow-up assessment. However, clinical intervention at this point might focus on efforts to increase verbalization about the incident, with the aim of increasing general arousal in response to reminders of the wreck. Then, a program of re-exposure could be engaged to bring about habituation to reminders of the wreck. Direct attempts to habituate to the fear-producing stimulus might then replace attempts to avoid distressing emotion through numbing.

In the third case, the participant demonstrated clear congruence between his self-reported symptomatology and physiological reactivity. As mentioned above, it may be that he had been re-traumatized by witnessing the shooting of another individual shortly before the interview. According to Green (1990), multiple episodes of extreme events increase the likelihood of developing PTSD or other stress-related psychopathology.
In this case, clinical intervention would directly target re-exposure to both traumatic events, again, with the goal of helping the individual to habituate to the trauma-related stimuli, which in turn would lead to a reduction in subjective symptomatology.

Finally, the fourth case presents the most difficult puzzle for the researcher and clinician; an individual who reports high levels of distress, but does not seem to present congruent affective or physiological responses. In some cases, a response pattern similar to this participant’s might raise questions of malingering for secondary gain of some sort, or some underlying DSM-III-R Axis II disorder. As in all other cases, therapeutic intervention would be best formulated after a thorough assessment of psychosocial factors, other existing pathology, and the presenting symptoms. In this individual’s case, issues to be explored might include exploring what the wreck and its consequences mean to the survivor and her family, what consequences might be operational in maintaining the high level of self-reported symptom response, etc.
CURRICULUM VITAE

Name: David Paul Ribbe

Date/Place of Birth: March 28, 1959 / Elmira, New York

Family Status: Married (Kelley); children (Aislynn, Nathanael, & Karelyn)

Home Address
330 Jean Street
Charleston, SC 29407
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Internship Address
Department of Psychiatry & Behavioral Sciences
Medical University of South Carolina
171 Ashley Avenue
Charleston, SC 29425

School Address
Department of Psychology
Virginia Polytechnic Institute & State University
Blacksburg, Virginia 24061-0436
(703) 231-6581

Education
September 1992 - August 1993
Department of Psychiatry and Behavioral Sciences
Medical University of South Carolina; Psychology Intern
Committees: Internship Seminar Training Committee
Rotations: Youth Inpatient - Youth Division, Institute of Psychiatry
Crime Victims Research & Treatment Center, Child and Adult Services
Charleston Area Mental Health Center - Child and Adolescent Services
Multi-Systemic Family Preservation Services

September 1986 - May 1993
Virginia Polytechnic Institute & State University
Ph.D. in Clinical Psychology
Thesis: The Effectiveness of Videotaped Peer Modeling in Children’s
Emergency Skill Acquisition and Fear Reduction
Dissertation: Chronic Psychological and Psychophysiological Sequelae Among
Adolescent Survivors of a Traumatic Bus Crash

January 1982 - December 1987
Trinity Evangelical Divinity School
Master of Arts in Counseling Psychology
Thesis: The Effectiveness of the Culture Shock Adaptation Inventory, II in
Assessing the Cultural Adaptation of Foreign Graduate Students

August 1977 - June 1981
Wheaton College
Bachelor of Arts in Psychology

August 1974 - June 1977
The Stony Brook School (College Preparatory)
Licensure
August 1991-93  West Virginia Board of Examiners in Counseling  (license #928)

Expert Witness Experience
February 1993  Berkeley County Department of Social Services v. Parnell & Patricia Smith.  South Carolina Family Court, 9th Judicial District.  Gave expert testimony in child sexual abuse case.

Professional Affiliations
Psi Chi
American Psychological Association (APA)
APA Division 12, Section 1, Clinical Child Psychology
International Society for Traumatic Stress Studies (ISTSS)
Association for the Advancement of Behavior Therapy (AABT)
Virginia Psychological Association, Virginia Academy of Academic Psychologists, & Virginia Academy of Clinical Psychologists (VPA, VAAP, VACP)

Academic Honors and Awards
Recipient, NIMH Post-doctoral Fellowship Training Grant, Crime Victims Research and Treatment Center, Medical University of South Carolina, 1993-94
Recipient, Faculty Travel & Research Grants (Hollins College), 1991 & 1992
Recipient, Graduate Student Assembly Travel Fund Awards (VA Tech), 1991 & 1992
NIMH Clinical Child Fellow
Graduate Teaching Assistantships, Department of Psychology, Virginia Polytechnic Institute and State University
Recipient, Graduate State Tuition Scholarship (Virginia)
Graduated with Honors (Cum Laude)
Trinity Evangelical Divinity School
Graduated with Honors (Cum Laude) & Kinney Scholarship (academic excellence)
The Stony Brook School, Stony Brook, Long Island

Workshops / CEU Credits
Cognitive Therapy Workshop  12 hours  Saint Alban’s Psychiatric Hospital
CEUs (ISTSS Conference)  13 units  Bradley Hospital
Family Therapy Workshop  6 hours  Virginia Psychological Association
The Narcissistic Personality  6 hours  South Carolina Psychological Ass’n
Grand Rounds  ongoing  Department of Psychiatry, MUSC
Science Fair Activity

February 1992 Social Sciences judge at Southwest Virginia Regional Science Fair, Roanoke College, Roanoke, VA. Gave presidential "Stop Smoking by the Year 2000" award.

Professional Experience

Department of Psychology
Hollins College
Roanoke, Virginia 24020
(July 1, 1991 to June 30, 1992)

Instructor for Fall Semester, Short Term, and Spring Semester, 1991-92:
■ Short Term Course
■ Abnormal Psychology
■ Physiological Psychology
■ Graduate Research Practicum
■ Research Methods and Statistical Design
■ Clinical Child Neuropsychology I: Theory and Research
■ Clinical Child Neuropsychology II: Assessment and Clinical Issues

Masters Thesis Committee Chair: Terry Bailey

Department of Psychology
Virginia Polytechnic Institute & State University
Blacksburg, Virginia 24061
(September 1986 to May 1991)

August 1990 - May 1991
Instructor, Psychology of Learning (2 semesters)

September 1989 - May 1990
Clinical Internship, Saint Alban’s Psychiatric Hospital, Child and Adolescent Program. Supervisor: D. Hamilton, Ph.D.; 680 hours.

September 1989 - May 1990

May 1989 - May 1990
Volunteer, RAFT Community Crisis Center hotline; 162 hours.

January 1989 - May 1989
Graduate Teaching Assistant, Abnormal Psychology and Introductory Psychology.

August 1988 - December 1988
Clinical Practicum, University Counseling Center, Virginia Polytechnic Institute & State University. Supervisors: B. Warren, Ph.D.; J. Hochschartner, Ed.D.; 120 hours
August 1988 - December 1988
  Graduate Teaching Assistant, Abnormal Psychology

June 1988 - August 1988
  Clinical Practicum, Veterans Administration Medical Center, Mountain Home,

September 1987 - May 1988
  Individual Therapist, Psychological Services Center, Supervisors: R. T. Jones,
  Ph.D.; C. Pickett, Ph.D.

March 1988 - May 1988
  Graduate Teaching Assistant, Abnormal Psychology

September 1987 - December 1987
  Graduate Teaching Assistant, Honors Introductory Psychology

September 1986 - June 1987
  Individual Therapist, Psychological Services Center, Supervisors: G. Clum,
  Ph.D.; R. T. Jones, Ph.D.

March 1987 - June 1987
  Graduate Teaching Assistant, Abnormal Psychology

September 1986 - March 1987
  Graduate Teaching Assistant, Introductory Psychology (four discussion sections)

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**Psychology Service (116-B)**
Veterans Administration Medical Center
Mountain Home, TN
June 15, 1988 to August 19, 1988

**Clinical Traineeship (360 hours)**
  -Neuropsychological assessment
  -Neurological examination
  -Biofeedback assessment & treatment
  -Christian biblical counseling
  -Admitting office assessment and referral
  -ICU screening & psychotherapy follow-up

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**College of Lake County**
19351 West Washington Street
Grayslake, Illinois 60030
September 1985 to July 1986

January 1986 - August 1986
  Instructor, Introductory Psychology (two semesters)

September 1985 - December 1985
  Psychology Tutor: Introductory, Abnormal, Industrial/ Organizational
  Psychology
Highland Park Hospital
718 Glenview Avenue
Highland Park, Illinois 60035
June 1981 to June 1986

Title: Psychiatric Technician II
Job Description: Worked full-time for five years on a 28-bed inpatient psychiatric unit in a private, community hospital. Responsibilities included facilitating group therapy with adolescents, psychotics, elderly patients, and mixed populations. Provided primary care for 4 to 6 patients per shift. Assisted with medical procedures, the physical management of violent patients, and organizing the routine of the unit.
Instrumental in establishing the current adolescent program at H.P.H., which included three daily groups, school instruction and supervision, adjunctive psychotherapy, off-unit activities, family group, and 1:1 staff interactions. Responsible for communicating with physicians and charting the progress of each primary patient.
Attended multi-disciplinary staffings on patients. Worked with the Head Nurse to revise and write the Policy and Procedure Manual for the unit. Devised or revised administrative forms to streamline paperwork for staff. Taught in-service training programs on the management of violent patients, psychotherapy, and patient interactions.

University of Louisville
Louisville, Kentucky
June - August 1980

Senior Psychology Internship: Participated in a two-month internship program. Observed the milieu of a locked inpatient psychiatric unit, attended grand rounds daily with the psychiatric residents, observed medical and psychological assessment procedures, attended lectures on medical and psychological disorders, attended multi-disciplinary team meetings on the status, treatment, and/or placement of patients, observed ongoing research with the treatment of schizophrenia with hemodialysis, visited the state psychiatric hospital, participated in emergency triage assessment of incoming psychiatric patients, and took comprehensive exams on psychiatric disorders and their treatment.

OTHER EMPLOYMENT

International Business Machines
Office Products Division
One IBM Plaza
Chicago, Illinois
December 1980 to May 1981

Title: Student Sales Support Assistant
Job Description: Worked part-time with the Office Products Division of IBM as a student trainee during college. Demonstrated IBM products to Chicago businesses, evaluated and installed office equipment, and obtained sales leads for the company.
United States Navy &
University of Alaska (Fairbanks)
Naval Arctic Research Laboratory
Barrow, Alaska
June - October 1978

Titles: Photo-Journalist, Clerk Typist, Laboratory and Research Assistant

Job Description: Researched past and present scientific projects conducted at N.A.R.L. and compiled the data into quarterly progress reports for the Office of Naval Research in Washington, D.C. Maintained the NARL photography lab and darkroom, and took photographs on assignment for the Office of Naval Research and various in-house publications. Did the photo research and lay-out for two NARL brochures, and made a detailed map of the locations of scientific out-posts on the North Slope of Alaska. Assisted with the care of Arctic animals in the Animal Research Facility, worked with the Assistant Director for Science researching mushrooms on the tundra and the effect of oil on the tundra, and researched literature on the migration patterns of beluga whales for a whałe research team. References available upon request.

Professional Goals

Upon completing doctoral requirements in April, 1993, I plan to take either: (1) a post-doctoral fellowship position in a setting where I can obtain specialized research and clinical training in the area of post-traumatic stress disorder (PTSD), disaster, and victimization among child, adolescent, and adult trauma victims; or (2) a faculty position at a medical or research university where I can continue research and clinical work in the field of trauma and psychological adjustment, as well as train undergraduate and graduate students in clinical and research skills. I plan to obtain professional licensure within a year of completing internship training.

Research Interests

Psychological, psychosocial, and psychophysiological responses to trauma, and post-traumatic stress disorder (PTSD) in children, adolescents, and adults.

Prediction of children’s and adolescents’ mental health from parent and child lifetime high and low magnitude stressful events, personal characteristics, resource loss, and pre-existing psychopathology.

Developmental differences in children’s stress appraisals, coping efforts, and adaptational outcomes in stressful medical and dental situations.
Papers and Presentations


Ribbe, D. P. Cultural adaptation of foreign graduate students in the United States. Presented at University Counseling Services, Virginia Polytechnic Institute & State University, Blacksburg, VA, January, 1989.


Manuscripts Submitted for Review

Ribbe, D. P., Jones, R. T., & McCarthy, D. M. Use of videotaped peer modeling in the acquisition of emergency coping skills: Active versus passive strategies.

Works in Progress


Jones, R. T., Ribbe, D. P., & Cunningham, P. B. Psychosocial correlates of fire disaster among adults.

Jones, R. T., Ribbe, D. P., Cunningham, P. B., & Bailey, T. One-year follow-up study of adolescent victims of a dormitory fire.


**Book Reviews**


**Editorial Review Activity**

Anxiety, Stress, and Coping: An International Journal

[Signature]

Daniel Paul Ribbe