FACTORS ASSOCIATED WITH POSTTRAUMATIC GROWTH FOLLOWING TRAUMATIC BRAIN INJURY: RUMINATION AND SELF-DISCLOSURE.

by

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ABSTRACT

CASSIE MARIE LINDSTROM. Factors associated with posttraumatic growth following traumatic brain injury: rumination and self-disclosure. (Under the direction of DR. ARNIE CANN and DR. LAWRENCE G. CALHOUN).

The current study examined posttraumatic growth (PTG), the experience of positive change following a traumatic event, in a sample of traumatic brain injury (TBI) survivors. The focus was on the role of rumination and self-disclosure about trauma in the experience of PTG. Participants (N = 76) were TBI survivors drawn from an existing brain injury survivor database who completed questionnaires over the phone. Participants responded to questionnaires evaluating current depression symptoms, current intrusive (unwanted, distressing) and deliberate (thoughtful, purposeful) rumination, disclosure about PTG and about the negative consequences of the TBI, and experienced PTG. Self-disclosure about a traumatic event was theorized to play an important role in the development of PTG. Challenge to core beliefs about the self, others and the world has been shown to be a key component in PTG development as it prompts rumination and self-disclosure about the event as ways to make sense of one's new circumstances. Self-disclosure was assessed by evaluating desire to disclose, actual disclosure, and reactions to disclosures by important others. Findings suggest that helpful (supportive, empathic, understanding) responses to disclosures about PTG facilitated PTG, above and beyond deliberate rumination, a known strong positive predictor of PTG. Implications for clinical practice with TBI survivors are discussed.

DEDICATION

This is dedicated to my incredibly caring and generous partner, Jeffery Alan Hudson, to my loving and supportive family, Richard Keith Lindstrom, Victoria Anne Lindstrom, Christie Anne Lindstrom, and Shannon Lee Lindstrom, and to my loyal and steadfast friends, Carrie Louise Cronk and Dr. Kelli Nicole Triplett. The support from all of you has been invaluable not only in helping me to complete my dissertation, but in persevering to obtain my doctoral degree. Finally, I would like to dedicate this to my trailblazing grandmother, Dr. Victoria Wiechert Callaghan, who was first in our family to obtain her doctorate and who inspires me to this day.

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LIST OF ABBREVIATIONS

LOC	loss of consciousness
MVA	motor vehicle accident
PTA	posttraumatic amnesia
PTG	posttraumatic growth
TBI	traumatic brain injury

CHAPTER 1: INTRODUCTION

Posttraumatic growth (PTG), the experience of positive changes resulting from the struggle with a traumatic event (Calhoun & Tedeschi, 1999, 2006; Linley & Joseph, 2004; Tedeschi & Calhoun, 1995, 2004) has received increasing attention in the literature over the past few decades. The model of PTG originally proposed in 1995 (Tedeschi & Calhoun, 1995) has evolved over the years though many of the main components remain. The model of PTG posits that trauma may cause a challenge to previously held core beliefs about the self, others and the world. New information brought to light by the trauma may require a reevaluation of core beliefs if the information does not fit into the existing schemas. The internal discomfort resulting from this disconnect may prompt rumination, both intrusive (unwanted, invasive thoughts) and deliberate (purposeful, intentional thoughts). Rumination is one way in which new information can be examined and interpreted, and may facilitate making meaning of the event. Trauma survivors may also engage in self-disclosure about the traumatic event and its aftermath; theory suggests that rumination is likely to prompt disclosure about trauma-related stimuli. Self-disclosure as referred to in this chapter is meant to include desire to disclose, actual disclosure, and perceived reactions to disclosure. These distinctions are important since desiring to disclose, but not acting on that disclosure, or actually disclosing but feeling un supported, could lead to different responses. Disclosure about negative consequences of the event is believed to be important as a means of coping with distress, but we posit

that disclosure about growth plays a more central role in the processes leading to posttraumatic growth. If disclosure occurs and is met with generally supportive responses, growth is more likely to occur.

In recent years, the importance of challenge to core beliefs and rumination in the PTG process have been supported by research findings (e.g., Cann et al., 2010, Lindstrom, Cann, Calhoun, & Tedeschi, 2011; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012). Less has been done to explore the contribution of self-disclosure, despite its hypothesized role as a primary component in the development of PTG (Calhoun & Tedeschi, 1999, 2006; Tedeschi & Calhoun, 1995, 2004). Moreover, very few studies have assessed the interplay of rumination and self-disclosure processes in the context of PTG. This is troubling as the model of PTG posits an intimate relationship between rumination and self-disclosure (Calhoun & Tedeschi, 1999, 2006; Tedeschi & Calhoun, 1995, 2004).

Trauma survivors who find their core beliefs challenged by the trauma are likely to engage in rumination (Greenberg, 1995; Lindstrom et al., 2011; Triplett et al., 2012), and recently it has become clear that a distinction between intrusive and deliberate rumination is necessary when examining the role of rumination in the PTG process (Cann et al., 2010; Lindstrom et al., 2011; Proffitt, Cann, Calhoun, & Tedeschi, 2007; Triplett et al., 2012). Intrusive rumination is likely to occur for most trauma survivors especially soon after the trauma. Intrusive rumination refers to unwanted, distressing thoughts about the trauma that are experienced as invasive and are likely to prompt efforts to block or avoid content of thoughts. The continued presence of intrusive thoughts is often associated with depression (Nolen-Hoeksema, 1991; 2000). Some individuals engage in

deliberate rumination, i.e., purposely bringing to mind event-related thoughts, images, and memories so as to allow for an evaluation of the event and related stimuli (Martin & Tesser, 1996; Watkins, 2008). As time since trauma passes trauma survivors may engage in more deliberate rumination and less intrusive rumination as they control their distress and can begin efforts make sense of the event and incorporate new information into restructured schemas about themselves, others, and the world (Calhoun & Tedeschi, 1999, 2006; Tedeschi & Calhoun, 1995, 2004).

Rumination about the event is theorized to prompt the desire for event-related disclosure to significant others which, in turn, has been shown to be related to less intrusive thinking (Klein, 2002; Lange, Schoutrop, Schrieken & van de Ven, 2002). Research on posttrauma behavior indicates that the vast majority of trauma survivors talk about their trauma to other people especially soon after the event (Rime, 2005, 2007, 2009; Rime, Finkenauer, Luminet, Zech, & Phillipot, 1998). This may be driven by a sometimes unconscious need to remedy discrepancies between existing schemas and new information made available by the trauma experience (Janoff-Bulman, 1992, 2006; Lepore, Silver, Wortman, & Wayment, 1996; Linley & Joseph, 2004; Parkes, 1971; Tedeschi & Calhoun, 2004). As trauma survivors are grappling with information that is incongruent with previously held core beliefs they are likely to turn to others for emotional support, distress alleviation, and assistance in making sense of their new reality (Clark, 1993; Lepore et al., 1996; Lutgendorf & Antoni, 1999). Contemplation of possible benefits of the struggle with the traumatic experience is likely to prompt disclosure about these in addition to the negative consequences of the trauma. Although little is known about the role of self-disclosure in PTG development, theoretical models

of PTG and the vast literature on self-disclosure after trauma provide a basis from which we can make educated predictions about why appropriate self-disclosure could facilitate growth.

The current study seeks to fill this gap in the literature by examining rumination, self-disclosure, and posttraumatic growth together following a traumatic event, namely traumatic brain injury (TBI). TBI has been studied extensively but very little research has focused on potential positive changes resulting from struggling with a TBI.

Examination of the possible positive changes after TBI is important in part because so many people are currently living with a TBI and there is reason to believe that these numbers will only continue to grow. In fact, the World Health Organization (WHO) has predicted that traumatic brain injury (TBI) will become the leading cause of death or disability by the year 2020 (Hyder, Wunderlich, Puvanachandra, Gururaj & Kobusingye, 2007). TBI is increasingly common in the United States, with estimates for annual incidence placed between 180 and 250 per 100,000 people according to some researchers (Bruns & Hauser, 2003). This translates to approximately 1.5 million traumatic brain injuries to Americans each year (Thurman, Alverson, Dunn, Guerrero & Sniezek, 1999). Of these, approximately 50,000 of the injuries result in death, 230,000 result in hospitalization and recovery, and between 80,000 and 90,000 people sustain injuries that result in long-term disability(ies). Many of the remaining TBIs are mild and do not require hospital admission and are treated in outpatient settings. More recent estimates of prevalence indicate previous estimates may have been slightly low; newer estimates indicate the rate may be as high as 506.4 per 100,000 (Langlois, Rutland-Brown & Thomas, 2006). The most recent findings from the Centers for Disease

Control's (CDC) National Center for Injury Prevention and Control (NCIPC) indicate that 235,000 people in the United States are hospitalized and treated for TBI then released while 1.1 million Americans each year are seen for TBI in the Emergency Department (ED) and do not require hospitalization. The estimate of annual mortality (50,000) has not changed (Langlois et al., 2006). More recent estimates of the number of TBIs per year which result in long-term disability are higher (124,000 or 43.1%; Selassie et al., 2008) than previous estimates (80,000-90,000; Thurman et al., 1999). This is due in part to the fact that people who would have died from their injuries in the past are likely to survive because of emergency care technological advances (Cunningham et al., 1999).

This chapter continues with a background on TBI and consequences relevant to the current study. Then background on PTG is provided. The literature on PTG after TBI and similar events, i.e., motor vehicle accidents, strokes, and acquired brain injuries, is reviewed. Findings from the few studies that examined PTG after TBI are discussed in detail. Finally, relevant theory and empirical evidence regarding the relationships between rumination, self-disclosure, and posttraumatic growth are used to inform the objectives of the current study.

Traumatic Brain Injury

In the late 1980s, the CDC's NCIPC created a model to estimate the number of people living with disability resulting from TBI. Based on the model, they estimated that 5.3 million Americans (2% of the U.S. population) were living with TBI-related disability in 1996. They suggested this might be an underestimate because it did not include individuals who were not admitted to the hospital. Zaloshnja, Miller, Langlois and Selassie (2008) more recently estimated the number of people who sustained TBIs

that were severe enough that they resulted in long-term disability. Taking into account the increased mortality rate in the TBI population, Zaloshnja and colleagues (2008) estimated that at the beginning of 2005, 3.17 million people (1.1% of the U.S. population) were likely to be alive and living with a disability resulting from a TBI. They noted that they were conservative in estimating number of deaths in this population, so it is possible, even likely, that this number is an overestimate. Although the exact number of people currently living with TBI-related disability is not known, these estimates suggest the number is substantial and speak to the significant U.S. public health issue around traumatic brain injuries. TBI is becoming a nationally recognized public health issue of considerable concern. In addition, predictions by the WHO indicate that the experts on health issues are aware of the enormity of this issue worldwide (Hyder et al., 2007).

TBI rates continue to rise. Reasons for increasing TBI rates include heightened awareness of these injuries, better methods of injury detection and improved medical treatments so that more people survive TBI than in the past. However, the actual number of injuries is also rising. The aging of the U.S. population is one probable reason for the increase. Falls are common in older adults and there are currently more older adults in the U.S. than there have been in the past.

In addition to estimating the prevalence of TBI, many researchers have explored the risk factors for sustaining a traumatic brain injury. Sex is a risk factor for TBI. In nationwide studies of Emergency Department (ED) injuries conducted from 1992-1994, there were 1.6 males with a TBI for every female victim (Jager, Weiss, Coben & Pepe, 2000). In 1994, seven states (including Colorado, New York and South Carolina) agencies financially supported by the Centers for Disease Control (CDC), collected data

on TBI injuries and deaths for the entire year with the goal of obtaining a better estimate of the incidence, risk factors, and nature of traumatic brain injuries (Thurman et al., 1999). Findings from this project provided some useful information about the incidence of injuries, causes, demographics of individuals sustaining injury, and number of deaths by injury. Males were more than twice as likely as females to sustain a TBI (124.1 per 100,000 men; 59.1 per 100,000 women). This number differed slightly in the national survey of ED injuries not requiring hospitalization, conducted from 1995-1996; the ratio of male to female injuries was 1.7:1 (Guerrero, Thurman & Sniezek, 2000). The reasons for the sex discrepancy are the increased rate at which males sustain injuries resulting from MVAs and interpersonal violence during the adolescent and young adult years. During all other times of life, injury rates do not differ by gender (Bruns & Hauser, 2003).

In addition to sex, age is a significant risk factor, with incidence of TBI higher in early childhood, rises again in the late teens and early twenties, and shows another peak in elderly people, so it is a tri-modal distribution (Bruns & Hauser, 2003). Infants have higher rates of injury than do toddlers (155 per 100,000 infants; 104 per 100,000 toddlers) (Durkin, Olsen, Barlow, Virella & Connolly, 1998). Although estimates of late adolescence/early adulthood incidences have varied across samples, they have generally been high. Annual incidence was estimated to be 280 per 100,000 in a study done in San Diego (Kraus et al., 1984). A study of 15-24 year olds in Olmsted County, MN determined an incidence rate of 415 per 100,000 (Annegers, Grabow, Kurland & Laws, 1980), while a Bronx, N.Y. study found incidence rates of 350 per 100,000 for 16-30 year olds (Cooper et al., 1983). After young adulthood, TBI incidence decreased and was

especially low in older adults and middle-aged adults, but evidence from several studies indicate that incidence peaks in the elder years. This trend appears to be almost universal across populations (Bruns & Hauser, 2003). Injuries in the elderly are most frequently caused by car accidents and falls (Bruns & Hauser, 2003). In this group, incidence increases with age with those above 85 years old at highest risk for injury. Indeed, a national survey of emergency departments indicated that the annual incidence of injuries for those 85 and older was 1026 per 100,000 (Jager et al., 2000).

TBI incidence rates also vary by ethnicity (Jager et al., 2000). A study assessing emergency department visits for injuries from 1992-1994 indicated that incidence by ethnicity per 100,000 was as follows: 582 African Americans, 429 Caucasians, and 333 for 'Other' groups. These numbers indicate that African-Americans sustained TBIs at a rate 35% greater than Caucasians. One reason for the higher rates of TBI in African-Americans is the frequency with which members of this group sustain gun-related injuries (Thurman et al., 1999). Bruns and Hauser (2003) make the important point that the differences in TBI rates by ethnicity are confounded by socioeconomic status, with African-American males, especially youths, more likely to sustain TBI injuries than other groups. African-Americans are also overrepresented in high poverty situations (Fletcher, 2013).

Risk factors for TBI, then, include being male, African-American, and age: being a young child (0-4), a young adult (approximately 15-24) or being elderly (especially over 75 years of age). Incidence varies by age tri-modally such that incidence is highest at a very young age, in the late teens and early twenties and then in the elder years, but the cause of injury differs depending on age at time of injury.

These data on the prevalence of TBIs demonstrate the importance of examining TBI as a trauma and seeking a better understanding of the potential for PTG in the aftermath of TBIs. Although a comprehensive discussion of TBI consequences that may impact the likelihood of experiencing PTG is beyond the scope of this paper, a brief discussion of cognitive deficits and communication difficulties follows, since these issues can be tied to existing models of PTG.

Cognitive Deficits

Cognitive deficits following TBI are well-documented. Commonly experienced difficulties involve memory and attention deficits (Dikmen et al., 1995; Goldstein & Levin, 1996). Due to the variability among TBIs, it can be difficult to make general statements about the nature of resulting deficits (Vakil, 2005). TBI survivors often have diffuse brain lesions that result in a myriad of varied cognitive deficits within the population. In addition, deficits vary depending upon both severity of and time since injury. However, research on cognitive deficits commonly experienced by TBI survivors is useful to provide a general framework for understanding consequences faced by TBI survivors which may impact the development of PTG.

Executive Function

Executive function refers to the ability of the individual to oversee, control and regulate other cognitive facilities, such as attention, memory and information processing. Assessing deficits in executive function is challenging. Many of the neuropsychological tests that are typically used to assess cognitive deficits do not include opportunities for demonstration of executive functioning because there is not enough freedom (e.g., choice, decision-making, etc.) within the test to allow test-takers to demonstrate

competence, or the lack thereof (Lezak, 1995). However, tests of cognitive risk taking have demonstrated that there are often executive function problems in people with TBI. Burgess and Shallice (1996) found that individuals with frontal lobe damage had difficulty when asked to give words that did not relate to a previously read sentence; they were more likely than individuals with non-frontal lobe brain injuries to give related words. This task followed one where they were instructed to give related words or words to complete the sentence. The frontal lobe injured patients had more difficulty inhibiting their response. Bechara et al., (1994) compared frontal lobe injured participants to controls and found that the brain injured individuals were more likely to make choices which provided immediate gratification but resulted in long-term losses as opposed to making choices that had less of an immediate payout but would ultimately result in greater benefits. These findings provide quantitative data indicating that TBI can adversely affect executive function.

Research on test-taking behaviors has been informative with respect to executive function in individuals who have sustained a TBI. Milner (1964) reported that her patients with frontal lobe damage made different kinds of errors than those with other types of damage, such that they did not follow testing rules or perseverated on certain tasks. Similarly, Crowe (1992) tracked variables such as errors that did not comply with the rules of a test as an indicant of executive function impairment. Tate and Broe (1999) compared individuals who had sustained a TBI with non-injured counterparts on regulatory aspects of executive function and found that the former showed deficits in executive functioning compared to the latter. Those with a TBI made more rule-breaking errors, were less likely to self-correct after errors were made, generated fewer correct

answers, and demonstrated perseveration of answering. Although it is difficult to assess executive functioning, examinations of cognitive risk-taking and qualitative aspects of test performance indicate that these deficits do exist following TBI.

Attention

Attention is a multi-faceted, complex set of processes involving multiple areas of the brain (Posner & Petersen, 1990; Allport, 1993). Attention is conceptualized as involving three major components: orienting, selection, and sustained attention (Kinsella, 1998). Orienting refers to the involuntary process by which attention is focused on a specific point in one's field of awareness such that an event can be perceived. This can take the form of physical or mental orienting; people may physically move themselves toward something of interest, like turning toward a loud noise to see what caused it, or they may bring their mental attention to something that has crossed the mind, like concentrating on a particular sound. Selection is a higher order executive function which includes the involvement and control of brain areas needed to perform complex cognitive activities. Selection, sometimes referred to as filtering, refers to the brain's ability to allow in certain information and to exclude other information, such as when there are multiple conversations but one selects which speakers to allow into consciousness. Sustained attention refers to the ability to maintain attention on a given stimuli, e.g., paying attention to a presentation over a period of time.

Attentional deficits after TBI are common (Dikmen et al., 1995; Kinsella, 1998) and the nature of attention is such that deficits in this area are likely to result in difficulties with other cognitive processes, including learning new information (Kinsella et al., 1997). Although attentional deficits that are present soon after mild TBI often

resolve themselves without intervention (Bigler & Snyder, 1995), moderate and severe TBIs tend to involve more persistent, long-term attentional problems (Kinsella, 1998). Some researchers have argued that much of what drives differences between people with TBI and non-brain injured controls on attention-based tasks is information processing speed, which can also be affected by TBI-related damage. Rios, Perianez & Munoz-Cespedes (2004) designed an experiment to assess whether slowed information processing was the sole reason for the differences in performance on these tasks. Although some of the variance in performance was indeed predicted by differences in processing speed, speed alone was not enough to fully account for the differences and suggested that attentional control also contributed to the deficits displayed by people with TBI with respect to attentional tasks.

There is widespread support for the existence of attentional difficulties following TBI. These deficits can often be detrimental because attention is needed to perform many cognitive tasks.

Memory

Memory deficits are one of the most common complaints of TBI survivors and their loved ones (Oddy, Coughlan, Tyerman & Jenkins, 1985). Recovery from memory impairments appears to occur more slowly than from some other difficulties (Lezak, 1979) although some improvement in the first two years post-injury has been documented (Kersel, Marsh, Havill & Sleigh, 2001; Lannoo, Colardyns, Jannes & De Soete, 2001). Despite initial improvements, memory deficits are evident in many TBI survivors many years after injury (e.g., Zec et al., 2001).

Memory is not a single entity; it is comprised of many different functions including immediate memory. TBI survivors have often been tested for immediate verbal and visual memory (Vakil, 2005). Findings indicate that deficits are commonly present in verbal memory tasks, which may involve recall, recognition, or paired-associate tasks, among others that require participants to verbally respond to verbally presented material (Baddeley, Harris, Sunderland, Watts & Wilson, 1987; Zec et al., 2001). Several studies have demonstrated impairments in visual immediate memory in TBI participants (Hannay, Levin & Grossman, 1979; Levin, Grossman & Kelly, 1976; Reid & Kelly, 1993; Zec et al., 2001).

Working memory, also referred to as short term memory, is a system believed to be comprised of three components, the central executive, visuo-spatial sketchpad, and the phonological loop (Baddeley & Hitch, 1974). The latter two are systems that are controlled by the central executive. There is support for short term or working memory impairments following TBI (Christodolou et al., 2001). Haut, Petros, Frank and Lamberty (1990) found that TBI participants needed more time to access information stored in short term memory and respond to questions using this information. Some researchers have suggested that certain tests are more sensitive to tapping central executive impairments, which may be the driving force behind many of these deficits (Vakil, 2005).

Prospective memory involves the ability to plan ahead and to perform certain tasks at specific times or within a specific period of time or when a prompting event occurs, signaling the need to perform the task, even when otherwise engaged (Groot, Wilson, Evans & Watson, 2002) (e.g., remembering to pick someone up at a predetermined time, take the food out when the timer buzzes, or attend weekly Tuesday

meetings). Several studies have demonstrated that individuals who have sustained a TBI perform more poorly on tasks involving prospective memory functions than do controls (Groot et al., 2002; Kinsella et al., 1996; Mathias & Mansfield, 2005; Shum, Valentine & Cutmore, 1999).

Memory deficits are common following TBI and can involve many different aspects of the memory system. Immediate memory, working memory and prospective memory have been shown to be impaired in people with TBI compared to healthy controls.

Cognitive Deficits and Depression

Findings have been mixed regarding the subjective versus the objective measures of cognitive deficits, indicating that there is a somewhat complex relationship between the two. The patient's own perception of cognitive difficulties is not always congruent with objective measures of cognitive impairment (Chamelian & Feinstein, 2006). There is some evidence that this relationship is mediated by depression. Jorge et al., (2004) found that depressed TBI survivors performed significantly worse than their non-depressed counterparts on measures of executive functioning and memory although the severity of their injuries were comparable. Chamelian and Feinstein (2006) found that mild and moderate TBI survivors who reported subjective cognitive difficulties performed more poorly than those that did not endorse cognitive difficulties. These differences ceased to exist after depression was controlled for, indicating that perception of cognitive deficits may be symptomatic of depression, rather than indicative of actual cognitive impairment.

Social Consequences of Traumatic Brain Injuries

Studies have demonstrated that social and relational difficulties are common following TBI, especially moderate or severe TBI (Mooney, 1988; Morton & Wehman, 1995; Ylvisaker, Jacobs & Feeney, 2003). TBI survivors' compromised social skills inevitably affect other areas of social functioning as well.

Findings regarding communication difficulties resulting from cognitive deficits in TBI survivors indicate that they negatively affect interpersonal functioning (Struchen et al., 2008). Angeleri et al. (2008) suggested that part of what may contribute to interpersonal functioning problems is difficulty going beyond the literal message and inferring underlying messages, such as is required to understand humor, for instance. Memory deficits contribute to social challenges in many ways. TBI survivors often have retrograde amnesia, meaning loss of memory for events and experiences prior to the injury (Knight & O'Hagan, 2009). In addition, episodic memory loss for events post-injury is common. This is salient because it affects TBI survivors' ability to reflect back on past shared experiences with their loved ones and can contribute to feelings of social isolation for all involved parties. This adds yet another layer to the complicated nature of communication and interpersonal relationships with TBI survivors.

TBI survivors often have more difficulty carrying on conversations than non-injured individuals (Godfrey & Shum, 2000). Social communication skills impairments after TBI are likely (Spence, Godfrey, Knight & Bishara, 1993) and tend to persist over time (Oddy et al., 1985; Godfrey, Knight, Marsh, Moroney & Bishara, 1989). Some social skills impairments that are likely after brain injury include lack of appropriate responding to others, inappropriate social behavior, and lack of initiation of social contact (McDonald et al., 2008). As in any conversations, conversations TBI survivors have

with others are impacted by both parties (Togher, Power, Tate, McDonald & Rietdijk, 2010). Ylvisaker, Turkstra & Coelho (2005) note that there are reciprocal relationships between social abilities, acceptance by peers, and friendship. Impaired communication skills make socializing more difficult, and may result in uncomfortable interactions with others. As this is likelier to happen for TBI survivors because of the probability of impairment, they are at a heightened risk for being rejected by others. Several studies have indicated that people with TBI are treated differently in conversations than non-injured individuals in ways that make successful conversing by the TBI survivor less likely (e.g., Togher, Hand & Code, 1996; 1997a; 1997b). For instance, people may treat the TBI survivors as though they are less able to carry on a conversation by prompting the survivor or doing more of the talking. While this may be well-intentioned, occurring due to either explicit knowledge of the injury or as a reaction to perceived deficits, it can, nonetheless, be disempowering and send a message to the TBI survivor that they are somehow less than normal. These differences in communication with TBI survivors may also be present in the context of disclosure. TBI survivors may not have successful disclosure experiences, which may inhibit the growth process as disclosure and responses to disclosure is a theorized key component in the PTG process.

Posttraumatic Growth

The idea that positive change can result from the struggle with a traumatic event, posttraumatic growth, is a centuries-old concept. It is only in the past few decades, however, that this construct has been assessed systematically. Posttraumatic growth (PTG) has been demonstrated following a myriad of traumatic events, including but not limited to: cancer (Cordova, Cunningham, Carlson & Andrykowski, 2001; Cordova et al.,

2007; Lelorain, Bonnaud-Antignac & Florin, 2010; Weiss, 2004), sexual assault (Frazier, Conlon & Glaser, 2001; Grubaugh & Resick, 2007), natural disasters (Cryder, Kilmer, Tedeschi & Calhoun, 2006), HIV/AIDS (Milam, 2004), and bereavement (Engelkemeyer & Marwit, 2008).

PTG can be evaluated in terms of overall growth, but also with regard to five underlying dimensions. These dimensions are: Personal Strength, New Possibilities, Relating to Others, Appreciation of Life and Spiritual Change (Tedeschi & Calhoun, 1996). Personal strength involves the sense that although bad things happen, the person has the resources to deal with it. People report being more aware of their own vulnerability to bad things, but are more certain that they can handle whatever comes along (Calhoun & Tedeschi, 2006; Tedeschi & Calhoun, 1995). New possibilities refers to trauma survivors' ability to recognize new opportunities in life with respect to trying new activities, developing new interests, or even embarking on new career paths (Calhoun & Tedeschi, 2006). For instance, a former professional athlete who becomes paraplegic following a car accident may become a motivational speaker. Relating to others involves the reporting by trauma survivors that they realize how good people are, how many people care about them, and how they feel closer to loved ones (Calhoun & Tedeschi, 1999, 2006; Tedeschi & Calhoun, 1995, 2004). Trauma survivors often endorse a heightened appreciation of life, such that they no longer "sweat the small stuff" and are more thankful for each day. Finally, spiritual change can occur such that people feel they have a better understanding of spiritual matters or feel more connected to God (Calhoun & Tedeschi, 2006).

There is little research on this phenomenon following traumatic brain injury, although there is some preliminary evidence which suggests TBI survivors may experience PTG (McGrath & Linley, 2006; Powell, Ekin-Wood & Collin, 2007). Due to the scarcity of research on PTG and TBI, this section includes an examination of the impact of traumatic events that are similar to TBI: motor vehicle accidents (MVAs) and stroke. As stated above, MVAs are the most common cause of TBI, so MVAs were chosen because many TBI survivors were likely to have sustained their injuries from them. Stroke survivors also sustain injuries that are similar to TBI in that they often impact physical, psychological and cognitive functioning. Stroke is also a neurological issue, like TBI. Before discussing research on PTG in stroke and MVA survivors, the limited research on PTG after brain injury is reviewed.

Posttraumatic Growth Following Brain Injury

Two studies have examined posttraumatic growth following brain injury; both were conducted in the United Kingdom. The first study was cross-sectional and assessed individuals who had sustained an 'acquired brain injury', evaluating them either soon after their injury or after a long time had passed (McGrath & Linley, 2006). The participants included had brain damage resulting from stroke, TBI, subarachnoid hemorrhage, or hypoxia (the majority were stroke survivors). Participants in the 'soon after' injury group had sustained the injury from 3-16 months prior to assessment (M = 7 months). The 'late' sample had sustained injury between 60-209 months (from 5 to > 17 years) prior to assessment (M = 118 months or 9 years, 8 months). Scores on the PTGI (Tedeschi & Calhoun, 1996) were compared. Results indicated that the soon after group had overall PTGI scores (median score = 51, minimum = 32, maximum = 91) that were

considerably lower than the ‘late’ sample (median = 80, minimum = 22, maximum = 101). In addition, results indicated that the pattern of endorsement of dimensions of growth was consistent across the entire sample, with appreciation of life being most highly endorsed, followed by relating to others, personal strength, new possibilities, and finally spiritual change. Several participants spontaneously reported negative change in response to certain items, e.g., their faith was weaker, they felt less capable of handling issues, etc. One of the limitations of this study, with respect to the goals of the current review, is that participants met criteria for acquired brain injury (ABI), which is a much more broadly defined diagnosis than TBI. While a diagnosis of TBI is made only if the injury was caused by blunt or penetrating blow to the head or jostling of the brain (Bruns & Hauser, 2003), acquired brain injury also includes injuries caused by stroke.

A second study of PTG and brain injury employed a cross-sectional design with participants who had sustained a traumatic brain injury (Powell et al., 2007). Participants were assessed either soon after injury (‘Early,’ 1-3 years post-TBI; $M = 1.7$, $SD = .08$) or long after injury (‘Late,’ 10-12 years after injury; $M = 11.6$, $SD = 2.3$). The groups were comparable with respect to age, gender, injury severity, anxiety, and depression, among other things. Findings from this study, which also used the PTGI to assess growth, indicated that the groups differed significantly in how much they grew, such that the ‘Late’ group ($M = 68.1$, $SD = 16.6$) reported more growth than the ‘Early’ group ($M = 36.5$, $SD = 18.7$) ($p < .001$). The late group scored significantly higher than the early group on all dimensions of growth, with the exception of Appreciation of life, on which the late group scored higher but the difference did not reach significance.

In addition to assessing responses on the PTGI, the authors asked a single-item question: “The effects of my head injury have meant that in some ways my life has been richer and fuller” (Powell et al., 2007, p. 34) which was rated on a 6-point scale (0 = strongly disagree to 5 = strongly agree). The groups differed significantly on this item as well such that the early group (M = 1.6, SD = 1.5) was less likely to endorse this item than the late group (M = 3.0, SD = 2.0). Scores on this item and total PTGI were strongly positively correlated (r = .66, p < .01). Interestingly, the groups did not differ on an item reading, “The effects of my head injury have ruined my life,” (Powell et al., 2007, p. 35) (Early M = 3.2, Late M = 3.4).These findings indicate that although benefits of the struggle with a traumatic event may be noted, people would typically choose not to have experienced the trauma, and highlight the fact that distress and growth are likely to co-occur (Calhoun & Tedeschi, 1999, 2006).

Findings from the two studies that examined PTG following brain injury provide some information about the nature of this phenomenon in this population. Appreciation of life was the most highly endorsed dimension of growth. It is reasonable to consider that this may be related to the life-threatening nature of injuries to the brain. Despite endorsements of positive consequences of dealing with TBI, growth and distress are not mutually exclusive (Tedeschi, Calhoun & Cann, 2007), a pattern which has been observed in other populations (Tedeschi & Calhoun, 2004). TBI survivors who endorsed growth were no less likely to report negative consequences of their experience. Among those with TBI it appears that growth takes time to develop, such that soon after the injury, injured individuals may be unable to identify positive consequences of their struggle with TBI, but later on, reports of growth are quite common. Another reason for

this pattern may be that immediate cognitive deficits experienced might prevent focused constructive rumination and/or meaningful disclosure.

Posttraumatic Growth after Stroke

Only two studies have examined PTG in stroke survivors. A qualitative study with stroke survivors, which examined benefit-finding, a construct that is conceptually similar to PTG, found that the majority of the 16 participants (10; 63%) reported positive outcomes following from their stroke (Gillen, 2005). Specifically, they endorsed five themes related to positive consequences. They reported feeling closer to their loved ones, increased awareness and understanding of health concerns, increased religiosity, personal growth and altruism.

Gangstad, Norman and Barton (2009) examined the role of cognitive processing in development of PTG in stroke survivors. PTG was found to be negatively correlated with depression in this sample of 60 British stroke survivors. These researchers examined the role of cognitive processing using the Cognitive Processing of Trauma Scale (Williams, Davies & Millsap, 2002). Four aspects of cognitive processing: "positive cognitive restructuring, downward comparison, resolution, and denial" (Gangstad et al., 2009, p. 72) were positively correlated with total PTGI score. One can see why the ability to reframe or restructure information, as well as a drive to resolve things would be associated with experiencing positive changes as a result of struggling with negative events. In addition, those who recognize that others are having a harder time might be compelled to see the positive aspects of negative events because they are conscious that things might have been worse for them, and are worse for other people. Lastly, denial of negative content may facilitate growth because resources that would be used to attend to

negative stimuli are available for recognition of positive aspects. Although the findings from this study support the notion that stroke survivors report growth, the mean score on the PTGI was lower than it has been in some other studies, e.g., with cancer and amputation survivors.

Although the research exploring PTG after stroke is limited, tentative predictions can be made. Stroke survivors do report positive consequences resulting from their experience and it appears that cognitive processing plays an important role in this process.

Posttraumatic Growth following Motor Vehicle Accidents

Although not plentiful, research on PTG following Motor Vehicle Accidents provides some information about the experience of growth following events with many characteristics similar to TBIs. Like TBI survivors, MVA survivors often experience physical injuries and threat to personal wellbeing, perhaps even including fearing losing one's life. A German study of MVA survivors with and without PTSD found that MVA survivors reported some degree of PTG (Zoellner, Rabe, Karl & Maercker, 2008). Furthermore, findings indicated that both objective and subjective perceptions of severity of trauma were positively associated with PTG. Subjective perception of severity of the trauma was positively associated with the dimensions of New Possibilities, Spiritual Change and Relating to Others, while objective measures of severity were associated with New Possibilities and Personal Strength. The latter two areas of growth were also associated with time since injury, such that they increased as time since injury increased. Another notable finding was that there were differences between MVA survivors with and without PTSD with respect to their scores on different dimensions of growth.

Individuals with PTSD scored higher on Appreciation for Life and Spiritual Change, while individuals without PTSD scored higher on Personal Strength. Individuals who are struggling quite a bit in the aftermath of trauma such that they meet criteria for PTSD, may be less likely to perceive themselves as strong than those who are coping more effectively.

PTG following MVAs is not limited to adult accident survivors. A qualitative examination of PTG in children and adolescents between the ages of 7-18 who survived MVAs found that 42% endorsed some aspect of posttraumatic growth (Salter & Stallard, 2004). As was found in the aforementioned study with German adult MVA survivors, Appreciation of Life emerged as a common theme with the children with 31% making statements reflective of growth along this dimension.

Evidence for PTG after MVAs has also been found in studies assessing brain activity. Researchers performed Electroencephalograph (EEG) readings on MVA survivors (Rabe, Zollner, Maercker & Karl, 2006). They found that higher left fronto-central brain activation was associated with higher levels of PTG. This portion of the brain is believed to be involved in a phenomenon referred to as Psychological Well-Being (PWB) and activity in this area is said to be associated with things like the aptitude to persevere despite difficult circumstances, the perception of challenges as opportunities to grow, etc. These themes are intuitively relevant to the notion of PTG following TBI since damage in these brain areas might make it more difficult to conceptualize the event as a chance to grow or adapt despite extreme difficulty.

A recent study (Shakespeare-Finch & Armstrong, 2010) that examined differences in reported growth based on trauma type included participants who had

experienced multiple traumas but endorsed sexual abuse, bereavement or a MVA as the most stressful traumatic event they had experienced, and who rated their experience as severe or very severe. Participants who had been in a MVA generally reported moderate to high levels of PTG, which were higher than the sexual abuse group but lower than the bereaved group. There were no significant differences between MVA survivors and bereaved individuals on any PTG dimensions, although the bereaved group reported higher levels of overall growth and higher levels on all dimensions than both other groups (significantly so with respect to sexual abuse victims). There was a trend for MVA survivors to have lower scores on New Possibilities than the bereaved group, but this did not reach significance.

Findings from studies of PTG in MVA survivors can be used to inform research on PTG in TBI survivors because of similar characteristics and because MVAs are often the cause of TBI. MVA survivors report moderate to high levels of growth, brain activity in intuitively relevant areas is positively associated with growth, and individuals differ on growth dimension scores depending on PTSD status.

Rumination, Self-Disclosure, and Posttraumatic Growth

As noted above, few studies have examined how rumination and self-disclosure interact to facilitate PTG though this is theorized to be an important part of the growth development process. Research on rumination and self-disclosure after trauma can be used to inform predictions about their relationship in the context of PTG.

Trauma Recovery Theories

Theorists generally agree that soon after a trauma, survivors are likely to engage in cognitive processing of the event and related stimuli (Greenberg, 1995). There are

different theories to explain this processing and its role in recovery or resolution of trauma. Several theories about the relationships between posttrauma rumination and disclosure have been discussed in the literature, but three have received the most attention and have garnered the most empirical support.

According to Freud and other proponents of inhibition theory, actively trying to suppress or inhibit thinking or talking about the traumatic event is maladaptive (Frattaroli, 2006; Freud, 1904, 1954; Lepore & Smyth, 2002). Furthermore inhibition theorists argue that the energy used to suppress thoughts and feelings exacts an emotional toll on people thereby making it more difficult to function.

Although some support for this theory has been found it appears not to be sufficient to fully explain the importance of active cognitive processing of and talking about trauma (Pennebaker, 1993). Pennebaker and colleagues suggest a cognitive-processing theory to supplement inhibition theory. They acknowledge the deleterious effects of actively trying to keep trauma-related stimuli out of conscious awareness but also note the importance of verbalization of trauma-related thoughts and feelings in making sense of the event.

Pennebaker and colleagues found that written emotional disclosure was beneficial to participants in several studies (Pennebaker, 1993; Pennebaker, Colder & Sharp, 1990). When participants were asked why they perceived writing about a stressful event to be helpful, many reported that it allowed them to gain better insight into the experience (Pennebaker et al., 1990). Further examination of written disclosures revealed a pattern; people who increasingly used words indicating causation during their writing exercise found the disclosures more helpful than those that did not (Pennebaker, 1993).

Pennebaker subsequently proposed a cognitive-processing theory to explain the benefits of emotional disclosure. He proposed that when people verbalize their thoughts and feelings it helps them to consider more aspects of an event whereas thinking without disclosure may result in overfocusing on some factors while neglecting to consider others. He also suggested that talking allows people to reach a deeper understanding of what happened partly because it helps previously disorganized thoughts and feelings to be organized in a meaningful way. Finally, he purported that emotional disclosure was beneficial because it helped people to integrate the event into existing schemas.

In a similar vein, researchers have suggested that talking about a traumatic event helps in the construction of a coherent narrative, which may facilitate better understanding of the trauma and its meaning (Clark, 1993; Kestenburg, 1993; McAdams, 1993; Meichenbaum & Fitzpatrick, 1993; Neimeyer & Stewart, 1996). Several trauma theorists have stressed the importance of constructing a coherent narrative (Amir, Stafford, Freshman & Foa, 1998; Zoellner, Alvarez-Conrad & Foa, 2002). This theory suggests that traumatic memories are likely to be avoided and experienced as intrusive, especially for people who develop PTSD. Findings indicate that the ability to construct a coherent narrative of the traumatic event is associated with improved outcomes for trauma survivors (Amir, Stafford, Freshman & Foa, 1998; Zoellner, Alvarez-Conrad & Foa, 2002). Constructing a story of the event through writing, talking, or both also serves to act as exposure therapy. By writing or talking about the event the survivor is engaging the material actively and, in keeping with exposure theory, the exposure to the feared stimulus (in this case trauma-related stimuli, thoughts, feelings, and memories) results in reduced trauma-related anxiety and fear (Foa, Molnar & Cashma, 1995). Researchers

argue that this ability to engage with the material consciously and deliberately then allows survivors to develop a coherent narrative about the trauma that can then be integrated into their overall life story in a meaningful way (Lepore, Fernandez-Berrocal, Ragan & Ramos, 2004; van der Kolk & van der Hart, 1991), which allows for emotional and psychological adjustment.

All three of these theories are used to inform PTG theory. PTG theorists acknowledge the costs incurred by active attempts to avoid trauma- related stimuli, recognize the importance of processing the trauma so that better understanding of the event can be obtained, and know the importance of constructing a coherent trauma narrative (Calhoun & Tedeschi, 1998). In addition to using these theories to explain how recovery from trauma occurs, they also apply these theories to PTG development. The following section details the theorized roles of rumination and self-disclosure in the PTG process which are driven by the abovementioned trauma theories.

Intrusive ruminations are likely to occur for most trauma survivors especially soon after the trauma (Calhoun & Tedeschi, 1999, 2006; Creamer, Burgess & Pattison, 1992; Tedeschi & Calhoun, 1995, 2006). Intrusive thoughts about trauma are a hallmark symptom of PTSD, which most trauma survivors do not develop. However, many trauma survivors are likely to experience subclinical levels of posttraumatic symptoms, which may include intrusive thoughts about the event. Some individuals engage in deliberate rumination, purposely bringing to mind event-related thoughts, images, and memories so as to allow for an evaluation of the event and related stimuli. As time since trauma passes, trauma survivors may engage in more deliberate rumination and less intrusive rumination as they begin to make sense of the event and incorporate new information into

restructured schemas about themselves, others, and the world. Although intrusive rumination has been shown to be positively related to PTG, a review of posttraumatic growth literature indicates that deliberate rumination tends to have a stronger association (Linley & Joseph, 2004). In a study examining the role of intrusive rumination soon after the event, deliberate rumination soon after the event, recent intrusive rumination, and recent deliberate rumination, recent deliberate rumination emerged as the strongest predictor of growth (Taku, Cann, Tedeschi, & Calhoun, 2009). Soon after event intrusive and deliberate rumination were entered into a hierarchical regression predicting growth and were both significant predictors. However, when recent intrusive and deliberate rumination were added to the model, only soon after event intrusive and recent deliberate rumination remained significant, with recent deliberate rumination acting as the strongest predictor.

According to recent versions of the PTG model (Calhoun, Cann & Tedeschi, 2010), rumination about the trauma is theorized to prompt event-related disclosure to significant others (Calhoun & Tedeschi, 1999, 2006; Lepore, Silver, Wortman, & Wayment, 1996; Tedeschi & Calhoun, 1995, 2004). Retrospective reporting of deliberate rumination soon after a traumatic event was associated with discussion of positive and negative consequences of the event in a study with college students (Lindstrom, Cann, Calhoun, & Tedeschi, 2011). In a study of bereaved mothers, intrusive thoughts about the deceased child three weeks after the death were positively associated with desire to talk and actual amount of talking about the event (Lepore, Silver, Wortman, & Wayment, 1996). It is important to note that the relationship between rumination and self-disclosure is reciprocal in that disclosures are also likely to provoke subsequent rumination

(Calhoun & Tedeschi, 1999, 2006; Rime, Paez, Basabe, & Martinez, 2010; Tedeschi & Calhoun, 1995, 2004).

For a long time psychologists have considered the disclosure of salient events to others a normal response (Jourard, 1971) and benefits of emotional disclosure are well-documented (Kelley, Lumley, & Leisen, 1997; Niederhoffer & Pennebaker, 2009; Pennebaker, 2003; Sherman, Bonanno, Wiener & Battles, 2000). Research on emotion indicates that the majority of people who experience an emotion talk about this "emotional episode" (Rime, Paez, Basabe, & Martinez, 2010, p. 1029) soon after the event (Rime, 2005, 2007, 2009; Rime, Finkenauer, Luminet, Zech, & Phillipot, 1998) regardless of emotional content (Rime, Noel, & Phillipot, 1991; Rime, Mesquita, Phillipot & Boca, 1991). The intensity of the emotion is associated with the number of times the emotion is discussed and the number of people disclosed to (Rime et al., 1998). More intense emotions are also talked about over a longer period of time. Talking about traumatic experiences is believed to be a critical part of recovery from or resolution of the trauma because this helps survivors to engage in cognitive processing to rework previously existing schemas that no longer work due to the challenges presented by new information (Calhoun & Tedeschi, 1998, 1999, 2006; Foa & Kozak, 1991; Janoff-Bulman, 1992; Lepore, Silver, Wortman, & Wayment, 1996; Pennebaker, 1993; Safran & Greenberg, 1991; Tedeschi & Calhoun, 1995, 2004).

It is widely believed that talking about a traumatic event is a critical and adaptive part of recovering from a trauma (Ullman, Foynes, & Tang, 2010). Kennedy-Moore and Watson (2001) refer to the idea that talking about a stressful event is both a sign of and a

means of coping with distress as the ‘paradox of distress.’ in that it is both a marker of difficulty adjusting and a way to facilitate adjustment to the trauma.

Disclosure brings with it an inherent risk, however. Early work on disclosure indicates that most people realize that the more they like a person the greater the risk they take in disclosing to that person (Barrell & Jourard, 1976) though the risk is only greater if the potential discloser believes there may be negative consequences. Ullman (1996a) found that sexual assault survivors identified blame, attempts to take away control, and distraction as commonly reported negative responses to disclosures. Ullman et al., (2010) found that negative reactions to disclosures of sexual assault history were predictive of worse outcomes for the discloser than failure to disclose at all. This is important because it contradicts long-held beliefs about disclosure as being inherently beneficial and suggests that reactions to disclosures can have a profound impact on whether or not disclosure works for or against the trauma survivor.

Recognition of the vulnerable position a discloser is in informs the prediction that disclosures met with affirming and supportive responses are believed to help survivors continue to engage in adaptive coping processes, such as deliberate rumination (Calhoun & Tedeschi, 1999, 2006; Tedeschi & Calhoun, 1995, 2004). In a study with college students disclosing about a traumatic event, experimenters engaged in reflective listening and procedures designed to help participants cognitively and emotionally engage with the topic of disclosure. Results showed that intrusive thoughts decreased over the course of the study. In addition, mood improvement and level of insight were positively associated with level of engagement during disclosures (Lutgendorf & Antoni, 1999). In a study of

sexual assault victims, being listened to in a supportive, nonjudgmental way was related to better adjustment (Ullman, 1996b).

The PTG model suggests that disclosure about the trauma will facilitate growth only if disclosures are met with helpful, supportive reactions (Calhoun & Tedeschi, 1999, 2006; Tedeschi & Calhoun, 1995, 2006). Although few studies have examined the relationship between negative reactions to disclosures and intrusive thoughts, related research supports this supposition. Rime, Mesquita, Phillipot and Boca (1991) found that talking about an event and rumination were unrelated, which led them to conclude that qualitative aspects such as the content of the disclosures were important to consider (Rime, Phillipot, Boca, & Mesquita, 1992). It is reasonable to suggest disclosure reactions are a qualitative aspect of disclosure that may also impact rumination. Existing research, thought limited, supports this notion. Women with breast cancer who perceived their social contexts to be unreceptive to disclosures about their illness did not benefit from talking about their illness (Stanton et al., 2000). Avoidance behaviors were significantly more common in individuals who perceived their disclosures were met with confusion than those who perceived their disclosures were met with sympathy in a study in Japan (Taku, Tedeschi, Cann, & Calhoun, 2009). Littleton (2010) found that negative reactions to disclosures about sexual assault were associated with avoidance of thoughts about the event and negative and self-blaming cognitions.

According to the PTG model, intrusive rumination soon after the trauma reflects psychological discomfort necessary to engage in more constructive cognitive processes that lead to growth (Calhoun & Tedeschi, 1999, 2006, Greenberg, 1995, Tedeschi, 1999, Tedeschi & Calhoun, 1995, 2004). Intrusive and deliberate rumination soon after a

traumatic event have been found to be predictive of PTG (Calhoun, Cann, Tedeschi, & McMillan, 2000; Lindstrom, Cann, Calhoun, & Tedeschi, 2010; Proffitt, Cann, Calhoun, & Tedeschi, 2007; Triplett, Tedeschi, Cann, Calhoun, & Reeve, 2012).

The PTG model highlights the importance of self-disclosure in the development of growth following a trauma (Calhoun & Tedeschi, 1999, 2006; Tedeschi & Calhoun, 1995, 2004). Although only a few studies have examined this relationship, those that exist support this aspect of the model. Individuals who disclosed about a traumatic event reported more growth than those that did not disclose (Taku, Tedeschi, Cann, & Calhoun, 2009). Talking about the illness was associated with higher scores on New Possibilities and Relating to Others in a study with cancer survivors (Morris, Shakespeare-Finch, & Scott, 2007). Disclosure about the illness was positively related to stress-related growth in a study of cancer patients (Henderson, Davison, Pennebaker, Gatchel, & Baum, 2002). While these studies serve as good first steps toward understanding the role of disclosure in this process, more information is needed to determine what kinds of reactions to disclosures facilitate growth.

Self-disclosures about the trauma that are met with empathic, supportive, helpful responses from the listener are theorized to facilitate further deliberate rumination and additional future disclosures (Calhoun & Tedeschi, 1999, 2006; Tedeschi & Calhoun, 1995, 2004). Although little is known about the role of self-disclosure in PTG development, theoretical models of PTG and the vast literature on self-disclosure after trauma provide a basis from which we can make educated predictions about what will facilitate growth. Indeed, a study in which participants disclosed stressful events to therapists who warmly and empathically reflected and reframed the emotional content of

the trauma revealed increases in positive mood and esteem and reductions in negative mood of study participants (Donnelly & Murray, 2001). Zech and Rime (2005) found that participants who talked about the emotions related to a trauma with an empathic listener perceived more resulting benefits than did those that talked about a trivial experience. Reactions to disclosures perceived as conveying sympathy, encouragement, and attentive listening were associated with higher PTG scores in a study of Japanese University students (Taku, Tedeschi, Cann, & Calhoun, 2009). In a study with gay and bisexual participants assessing the coming out experience, researchers found that acceptance of disclosure of sexual preference was positively associated with stress-related growth (Cox, Dewaele, van Houtte, & Vincke, 2011), a construct that is conceptually similar to PTG.

Objectives of the Current Study

Findings from the proposed study may help to clarify the process by which PTG develops. Many aspects of the model do not intuitively present opportunities for intervention but self-disclosure clearly does. Information on disclosure including desire to disclose, actual disclosure, and reactions to disclosures posttrauma could be used to inform loved ones how they can be more supportive to the trauma survivor. In light of the many treatments that may be required post-TBI in particular, e.g., physical rehabilitation, cognitive rehabilitation, vocational counseling, etc., there may not be time or resources to engage in formal mental health services immediately posttrauma. Education on PTG and reactions which are likely to facilitate this process can be provided to loved ones to facilitate better posttrauma psychosocial adjustment. Findings from this study also have further reaching implications for the PTG literature itself as it will serve as one of only a

few studies to examine the role of self-disclosure and the interplay between this factor and rumination in the growth process.

The proposed study will explore the relationships between rumination, self-disclosure, and posttraumatic growth in TBI survivors using the following hypotheses:

Dissertation Hypotheses

1. Deliberate rumination will be positively associated with more helpful responses to PTG disclosures.
2. Reactions to disclosures about negative consequences that are perceived as helpful will be positively associated with deliberate rumination.
3. More helpful responses to disclosures about PTG will be associated with less intrusive rumination about the event.
4. More helpful responses to disclosures about negative consequences will be associated with less intrusive rumination about the event.
5. Reactions to disclosures about growth that are perceived as helpful will be positively associated with PTG.
6. Reactions to disclosures about negative consequences that are perceived as helpful will be positively associated with PTG (though less strongly than reactions to disclosures about growth).
7. Deliberate rumination will be positively associated with PTG.
8. Deliberate rumination, reactions to disclosures about negative consequences, and reactions to disclosures about growth together will be positive predictors of PTG.

CHAPTER 2: METHODS

Design and Procedure

Participants were recruited from the Traumatic Brain Injury Model Systems (TBIMS) national database that was created in 1987 to track information about TBI survivors over time. Carolinas Rehabilitation in Charlotte, North Carolina was one of the 16 original TBIMS centers. The 1,051 participants being followed by this site served as the population from which the current sample was recruited. Enrollment in the TBIMS means that participants are tracked over time up to twenty years post-injury. Carolinas Rehabilitation is now a follow-up site and as such contacts participants at varying timepoints. Participants were eligible for the current study if they were 3, 4, 6, 7, 8, 9, or 12 years post-injury and if it was time for them to be contacted for follow-up. Participants who are less than 5 years post-injury are eligible to be contacted during a 6 month window that opens 3 months before the anniversary of injury, and closes 3 months after injury anniversary. Participants whose injuries were sustained 5 or more years prior are eligible to be contacted from 6 months prior to injury until 6 months after. After that period, they become eligible to be contacted for the next year. In other words, after the 6 months post-injury window closes for a participant being contacted for 6 year follow-up they become eligible to be contacted for 7 year follow-up. Lists of eligible participants were provided to the researcher who then attempted to reach them by telephone during the time of current study data collection, which began in April 2013 and ended in June 2013. Formal consent was not obtained for this study because initial enrollment in the

study required consent, which included an acknowledgement of the potential to be contacted for future studies. The Carolinas Healthcare System IRB determined that participants do not have to be re-consented because the protocol for the current study was approved and included as an approved amendment to the original protocol.

All calls were made by the researcher from Carolinas Rehabilitation, 1100 Blythe Boulevard Charlotte, NC 28203. If the spouse, caregiver, or another person living with the person was reached and the participant was not available the researcher verified information and asked for advice on how to reach the participant.

Upon successful contact with the participant, contact information was verified and participants were asked if they would be interested in participating in a study. When designing the study, the researcher consulted with experts who specialize in research with brain injured and otherwise cognitively compromised populations to determine how long the battery might take, and informed participants that it would take between 30-40 minutes. It more often took between 10-20 minutes. If during the administration of any measure it became apparent that the participant was not suitable for the study due to communication or comprehension issues, they were thanked for their time and the study was discontinued. When this happened the researcher documented in detail the circumstances leading to the decision to discontinue. There were also instances in which participants declined to participate, or were unable to be reached directly. We did not keep records of how many participants declined participation or how many participants were unable to be reached, but the researcher's perception was that the majority of potential participants who were reached directly were willing to participate in the study.

Next the researcher read the script used by TBIMS researchers to obtain contact information. Once that was accomplished, the following script was read to each potential participant.

"Thank you so much, Mr. or Ms._____. I have some additional questions that I would like to ask if you have time. I am a psychology doctoral student working on a study looking at how things go for people after surviving a brain injury. The study will help us understand better what things people find helpful after such an event. If you would like to participate, it will take about 30-40 minutes. You do not have to participate, it is completely voluntary. Though it is unlikely, some people may find some of the questions upsetting as I will be asking about your feelings. If you choose to participate, and at any time wish to stop for any reason, that is absolutely fine. Would you like to participate?"

After answering any questions participants had, they were then orally administered the rumination, self-disclosure, posttraumatic growth, and depression measures described below in random order. Measures were randomized using Randomizer.Com in order to control for possible order effects. A measure of depression was included as a control variable based on potential associations with outcome variables in this population.

Each phone call concluded with the researcher saying, "Thank you so much for answering questions, __name___. I know it can be difficult over the phone and I really appreciate you taking the time out of your day. Before I let you go, was there anything you thought I should have asked that I didn't?" Responses to this question were written down verbatim.

Participants

In order to be included in the TBIMS participants had to meet the following inclusion criteria: admitted to TBIMS hospital Emergency Department (ED) within 72 hours of injury, 16 years or older, received acute care and comprehensive inpatient rehabilitation at system hospital, and consent provided by patient, family, or guardian. Participants had to meet criteria for moderate to severe TBI on at least 1 of the following 4 criteria: posttraumatic amnesia (PTA) > 24 hours, loss of consciousness (LOC) > 30 minutes, intracranial neuroimaging abnormalities, or Glasgow Coma Scale (GCS) score in Emergency Department < 13). In order to be included in the current study participants also had to be English-speaking and be sufficiently able to communicate verbally as determined by the researcher during the first few minutes of the phone call. Participants who were identified as incapable of speaking on the phone by the person who answered were automatically excluded from the study.

The following demographic information is based on the original national sample of over 10,000 participants though it should be noted that in each area there are some missing data values. For each variable the number of participants whose data were used is listed. The TBIMS population is primarily male (74%, N = 10268). At time of injury participants ranged in age from 16 to over 86 years old (*M* = 39.78, N = 10269). The age breakdown is as follows: 16-25 (31%), 26-35 (17%), 36-45 (17%), 46-55 (14%), 56-65 (9%), 66-75 (6%), 76-85 (5%), and 86 years of age or older (1%). Racial breakdown was: White (67%), Black (20%), Hispanic (9%), Asian (3%), and 1% were classified as "Other" (N = 10267). At time of injury 29% of participants had less than a high school education, 35% had a GED or high school degree, 23% had some college, and 13% had

their Bachelor's degree or more (N = 10059). Of the participants for whom marital status data was available (N = 7663), most were single at intake (47%), while 32% were married, 16% were either divorced or separated, and 5% were widowed.

The most common cause of injury was vehicular (53%), 13% of injuries resulted from violence, 23% from falls, and 11% were classified as "Other" (N = 10239). Twenty-five percent of participants' blood alcohol levels were not tested at Emergency Department admission, but for the remaining 7391 cases, 53% were negative for alcohol, 2% had levels between 1-9 mg/dl, 44% had levels of 10 mg/dl or more, and 1% had positive unknown levels.

At admission, 38% of participants met criteria for mild TBI (GCS score of 13 or better), 16% met criteria for moderate TBI (GCS score of 9-12), and 46% met criteria for severe TBI (GCS score of 8 or less) (N = 7749, *M* = 9.49). Of the 9,866 participants for whom days of unconsciousness data were available, 43% were unconscious for a day or less, 26% were unconscious for 2-7 days, 12% were unconscious between 8-14 days, and 11% were unconscious for 15-28 days (*M* = 8.42). Duration of posttraumatic amnesia (PTA) was available for 7,776 TBIMS participants. Of these participants, 7% had PTA for a day or less, 16% met criteria for moderate severity based on PTA of between 1-7 days, 43% had PTA for 8-28 days (very severe), and 34% of participants had PTA for 29 days or more (extremely severe) (*M* = 24.41).

Current Study Participants

Of the 1,051 participants being followed by Carolinas Rehabilitation, 77 individuals agreed to participate in the current study. One participant was excluded when it became clear that he could not understand the battery items, resulting in a total of 76

participants. Participants were male (58; 76.3%) and 18 (23.7%) were female. Most were White (64; 84.2%), 11 (14.5%) were Black, and 1 (1.3%) was categorized as Other. At time of injury, patients ranged in age from 16-77 years old (*M* = 35.66, *SD* = 16.11) and their ages were as follows: 16-25 (28; 36.8%), 26-35 (14; 18.4%), 36-45 (12; 15.8%), 46-55 (11; 14.5%), 56-65 (8; 10.5%), 66-75 (2; 2.6%), and 76-85 (1; 1.3%). At the time of the study, participants ranged in age from 19-84 (*M* = 42.41, *SD* = 16.16) and their ages were as follows: 16-25 (12; 15.8%), 26-35 (19; 25%), 36-45 (17; 22.4%), 46-55 (9; 11.8%), 56-65 (10; 13.2%), 66-75 (7; 9.2%), and 76-85 (2; 2.6%). Thirty-seven (48.7%) of participants were single at time of injury, while 22 (28.9%) were married (legally or by common law), 11 (14.5%) were divorced, 4 (5.3%) were separated, and 2 (2.6%) were widowed.

At the time they were contacted to participate in the study, participants were at varying time distances from injury. Participants were eligible for the study if they were 3, 4, 6, 7, 8, 9 or 12 years post-TBI. The breakdown in years since injury (*M* = 6.75, *SD* = 2.95) was as follows: 3 years (N=16, 21.1%); 4 years (N = 5, 6.6%); 6 years (N =17, 22.4%); 7 years (N = 15, 19.7%); 8 years (N = 8, 10.5%); 9 years (N = 2, 2.6%), and 12 years (13; 17.1%).

The most common cause of injury was motor vehicle accidents (MVAs) (33; 43.4%), followed by motorcycle related incidents (23; 30.3%), followed by falls (7; 9.2 %). Gunshot wounds, assault with a blunt instrument, and ATV/ATC accidents (i.e., 3 and 4 wheelers, dune-buggies, go-cart accidents) each accounted for 3.9% of injuries, with 3 participants in each category. Injuries caused by ‘other’ sports (i.e., sports not included in field/track, air, water, gymnastic or winter sports) accounted for cause of

injury for 2 (2.6%) participants. ‘Other’ sports included e.g., horseback riding, skateboarding, rodeo, and auto racing accidents. Finally, 2 (2.6%) of participants’ injuries were sustained as pedestrians.

Measures

Participants of the current study were administered the measures listed below. Several variables including those assessing demographic, pre-injury functioning, injury, and postinjury factors were extracted from the existing TBIMS database by TBIMS researchers Dr. Flora Hammond and Tami Guerrier. When applicable, these variables were de-identified before being given to the primary researcher who then combined them with the data collected in the current study. See Appendix A for a comprehensive list of these variables.

Because the measures were administered over the phone with a population in which memory deficits are common, special care was taken to ensure that participants remembered the response scales for each measure. At the outset participants were told there would be a variety of response scales and encouraged to ask if they were ever unsure which they were responding to. Participants were provided with reminders of the response scales as needed or when deemed appropriate by the researcher.

Depression. Patient Health Questionnaire – 2 (Kroenke, Spitzer & Williams, 2003). The PHQ-2 is a 2-item measure of depression that was created by taking the depressed mood and anhedonia items from the Patient Health Questionnaire – 9 (PHQ-9). Participants are asked to rate on a scale from 0 (Not at all) to 3 (Nearly every day) the extent to which they experienced these symptoms within the past two weeks. Criterion validity was established by comparing diagnosis of depression to diagnoses made using

an independent structured mental health practitioner (MHP) interview. Using a cutoff score of 3 or more, the PHQ-2 demonstrated 83% sensitivity and 92% specificity in diagnosing major depressive disorder. In this sample, the PHQ-2 had an acceptable internal reliability, ($\alpha = .79$).

Rumination. The Event-Related Rumination Inventory Short-Form (ERRI-SF) was used to assess recent intrusive and deliberate rumination. The original Event-Related Rumination Inventory (ERRI, Cann et al., 2011) was factor-analyzed and the five items that loaded most highly for intrusive and deliberate rumination factors respectively were included in the short form. Participants rated the extent to which they agreed with each statement on a 4-point scale from 0 (Not at all) to 3 (Often). Typically, the items assessing both intrusive and deliberate rumination are administered twice, once for "soon after the event" and once for "recently" resulting in a total of 20 items. Given the nature of the sample, we elected to include only the items of the ERRI that asked about recent rumination, resulting in a 10-item scale with 2 subscales, which is called the ERRI-SF here. Both subscales have acceptable internal reliability: Recent Deliberate Rumination ($\alpha = .80$) and Recent Intrusive Rumination ($\alpha = .93$).

Self-disclosure. Self-Disclosure Inventory (SDI). This 22-item measure was created specifically for this study to assess disclosure of negative consequences of TBI and disclosure of positive things found from struggling with the experience, i.e., PTG separately. This resulted in 2 11-item subscales titled Negative Consequences Disclosure Scale (NCDS) and Posttraumatic Growth Disclosure Scale (PTGDS) which were administered separately in randomized order as if they were 2 completely independent surveys. (See Appendix B). The SDI assesses desire to disclose, actual disclosure, and

perceived reactions to disclosures from important others. No existing measure suited the purposes of the current study but the vast literature on self-disclosure and PTG theory informed the items chosen for this inventory. Four items were modified versions of items from the Social Constraint Scale (Cancer-Spouse Version, Lepore & Ituarte, 1999) which has acceptable psychometric properties. Findings from a study of disclosure and PTG in Japan were used as the basis for adding five possible reactions to disclosures participants may have experienced, i.e., confusion, mutual disclosure, encouragement, sympathy/comfort, and listening (Taku, Tedeschi, Cann & Calhoun, 2009).

Posttraumatic Growth Disclosure Scale (PTGDS)

The Posttraumatic Growth Disclosure Scale is an 11-item scale that began with 2 yes/no items that separately assessed (Item 1) desire to disclose, and (Item 2) actual disclosure. If participants responded 'No' to Item 2, indicating they had not disclosed about positive consequences of their injury, they would not complete the 9 subsequent items. Participants that did disclose were asked to evaluate the reactions to disclosures by rating their agreement with statements about reactions to disclosures by "loved ones." Participants rated the extent to which they agreed with each statement on a 4-point scale from 0 (Not at all) to 3 (Often). All 9 items assessing reactions to disclosures began with the same statement, i.e., 'When I talked about positive things that came from struggling with my injury, my loved ones…' Items included, e.g., 'listened to me,' 'tried to change the subject' (reverse scored), 'encouraged me,' etc. Item 10, which assessed whether loved ones shared about times they found positive things in difficult situations, was the only item on the PTGDS whose removal would facilitate improved reliability. Initial internal reliability was .63, after removal of Item 10 the final 8 item scale $\alpha = .67$.

Negative Consequences Disclosure Scale

The Negative Consequences Disclosure Scale was parallel to the PTGDS to the extent possible. Participants first responded yes or no to wanting to discuss negative consequences of their injury with their loved ones. The second item separately asked participants to respond yes or no as to whether they did disclose. If participants did not disclose, the measure was stopped. If participants did disclose, they then rated 9 statements about how their 'loved ones' responded to the disclosures, with response options ranging from 0 (Not at all) to 3 (Often). All of the 9 statements began with 'When I talked about negative consequences of my injury, my loved ones…" Internal reliability for the NCDS was .79 when all 9 reaction items were included. Analyses revealed that removal of item 10, which assessed whether loved ones shared about difficult times they'd faced, improved internal consistency. This item had been included based on the finding (Taku, Tedeschi, Cann & Calhoun, 2009) that Japanese trauma survivors had found 'mutual disclosure' helpful. In the current study sample, this item did not appear to be measuring the same construct as consistently as the other 8 items. Removal of Item 10 improved reliability; resulting in $\alpha = .82$.

Posttraumatic Growth. The Posttraumatic Growth Inventory – Short Form (PTGI-SF; Cann et al., 2010) was used to assess PTG. The PTGI-SF was derived from the 21-item original Posttraumatic Growth Inventory (PTGI; Tedeschi & Calhoun, 1996) which renders a total growth score as well as scores on each of the five domains of growth: Personal Strength, Relating to Others, Spirituality, Appreciation for Life, and New Possibilities. The PTGI has been used in many studies and has demonstrated acceptable reliability and validity and is unrelated to measures of social desirability. The PTGI-SF

was created with the goal of finding two items per domain that could be included in a 10-item scale. The two items that loaded most highly on Personal Strength, Spirituality, and Appreciation for Life were included. For Relating to Others and New Possibilities the items with the highest factor loadings (within domain) were too similar to each other and in effect assessed the same thing twice. For these subscales the authors selected two items per domain that had high factor loadings but also captured each construct more fully. The result is a 10-item scale with two items per domain on which participants rate statements on a 6 point scale (0 = I did not experience this change as a result of my crisis – 5 = I experienced this change to a very great degree as a result of my crisis). Because questionnaires were administered over the phone with a cognitively compromised sample, we limited the response to 4 options: 0 (Not at all), 1 (Small change), 2 (Moderate change) and 3 (Great deal of change).

Preliminary evaluation of the short form indicates that it captures much of the same variance, has acceptable validity and reliability, and loads on the same five factors as the PTGI (Cann et al., 2010). In the current study, the revised version of the PTGI-SF demonstrated good internal reliability ($\alpha = .84$). Although the participants were read the full responses at the beginning of the administration of this scale, they were provided with shortened reminders when they asked to be reminded or when the researcher deemed necessary.

CHAPTER 3: ANALYSES

Descriptive statistics were calculated. Correlational analyses were conducted to determine whether any medical or psychological variables were significantly related to study variables in ways that might affect findings meaningfully. A correlational analysis of reactions to disclosure scores and recent deliberate rumination was conducted to assess the hypothesis that reactions to disclosures perceived as helpful would be positively associated with recent deliberate rumination. A correlational analysis of reactions to disclosure scores and recent intrusive rumination was conducted to assess the hypothesis that negative reactions to disclosures would be associated with recent intrusive rumination. A regression analysis with reaction to disclosure scores predicting PTG scores was conducted to test the hypothesis that reactions to disclosures perceived as helpful would predict PTG. In order to test the hypothesis that recent deliberate rumination, as opposed to intrusive rumination, would be the strongest predictor of PTG, recent deliberate and recent intrusive rumination were entered simultaneously into a regression model predicting PTG. A stepwise regression analysis with PTG as the outcome was conducted with depression and years since injury entered in the first step, deliberate rumination entered in the second step, and finally both PTG disclosure reactions and negative consequence disclosure reactions in the third step, to determine whether they predicted variance in PTG scores after controlling for depression, years since injury, and deliberate rumination.

CHAPTER 4: RESULTS

Missing Data

Some data for this study were newly collected while other data were retrieved from an existing database (see Appendix A). There were missing data in the existing database for a few reasons. Participants were originally recruited within 72 hours of sustaining a TBI, so data were collected in a variety of medical settings and within the constraints of "real world" data collection. Data were collected over many years and collection strategies and procedures changed over time.

In the newly collected data, there were both some data missing for a few participants who answered "I don't know" to a small number of items, and for one participant who discontinued after completing only approximately half of the measures. There were also data that were not collected for participants depending on responses to certain items. Specifically, the 9 items on both the Negative Consequences Disclosure Scale (NCDS) and the PTG Disclosure Scale (PTGDS) that ask participants to rate statements about their experiences while disclosing, were not administered to participants who denied having disclosed. The nature of data collection was such that there were different numbers of participants included in the analyses depending upon the variables included. The number of participants in each analysis is reported in the text.

Two participants were missing 1- 2 items from the Negative Consequences Disclosure Scale because they answered "Not sure" or "I don't know." Instead of eliminating them completely from the analyses, mean scores for the scale were computed

using the answered items for each participant and used those in place of the missing values. The means were also consistent with sample means for the items that were replaced. The same method was used to replace one missing value for an item on the Posttraumatic Growth Disclosure Scale. Lastly, there was one participant who answered "I don't know" to an item on the PTGI-SF. The item was 1 of 2 items of the New Possibilities factor of the PTGI-SF. The participant's missing response was replaced with the response they endorsed to the answered New Possibilities item, which was '0' or 'Not at all.'

Medical and Psychological Variables

Several measures of brain injury severity were available in the originally collected data, but data were missing for some participants for each of these variables. Of the 76 participants in the current study, there were data for 54 on the period of posttraumatic amnesia (PTA), or period of time after injury for which participants have no memory. Days of PTA ranged from 0 to 123 (M = 29.67, SD = 22.28). Correlations between PTA (N = 54, M = 29.67, SD = 22.28) and all focal variables were conducted for participants for whom PTA information were available; there were no significant relationships. Glasgow Coma Scale (GCS) scores (Teasdale & Jennett, 1974) at time of admission to ER were only available for 27 of participants (M = 9.44, SD = 4.00). GCS scores range from 3-15, with higher scores indicating higher level of functioning or consciousness and are comprised of 3 scores: Best Eye Response, Best Verbal Response, and Best Motor Response. For instance, Best Motor Response score ranges from 1: No motor response to 6: Obeys commands. Correlations between GCS scores and focal variables were conducted; there was a significant correlation between GCS scores and reactions to

growth disclosures. There were only 16 participants for whom there were data on both GCS score and reactions to growth disclosures. For this group of participants, there was a significant negative relationship between GCS score and reactions to disclosures about growth (N = 16, r = -.62, p < .05). In other words, a more impaired GCS score (an indicator of injury severity, with lower scores reflecting more impairment) was associated with more supportive responses to disclosures about growth. There were no other significant correlations between GCS scores and study variables. Overall, these findings suggest that there is not much of a relationship between injury severity and study variables.

Depression was positively associated with both intrusive (N = 75, r = .43, p < .001) and deliberate rumination (N = 75, r = .46, p < .001). Depression was negatively associated with helpful reactions to growth disclosures (N = 59, r = -.41, p < .001) and helpful reactions to negative consequence disclosures (N = 54, r = -.60, p < .001). Higher self-reported depression was associated with thinking about the event, purposely and intrusively. Lower depression scores were related to more helpful reactions about either positive or negative consequences of the event.

While no formal hypothesis about PTG and years since injury was proposed, we examined the relationship between these variables to determine whether time since event might be important in this somewhat homogeneous sample of TBI survivors. Two previous studies with brain injury survivors found that after grouping participants into 2 groups to compare between recent (‘early’) injury survivors and those further out since injury (termed ‘late’), participants in the ‘late’ groups reported significantly more growth than the ‘early’ groups. In those studies participants in the ‘early’ groups had sustained

their injuries 3-16 months prior to study (McGrath & Linley, 2006) or within 1-3 years (Powell et al., 2007). In the current study participants were at least 3 years post-TBI, which may in part explain the finding of a significant negative relationship (N = 76, r = -.35, $p < .01$) such that as time since injury increased, PTG scores decreased.

Focal Variables: Patterns of Disclosure

The means and standard deviations for main variables are presented in Table 1, along with the correlations. Correlations between the major variables were conducted and specific analyses required to test hypotheses were also performed. See Table 1.

For hypotheses about disclosure, only participants who did disclose were included, so it was important to evaluate whether disclosers (N = 59) differed from non-disclosers (N = 16) on any key variables. Scores on focal variables (years since injury, depression, intrusive rumination, deliberate rumination, negative consequence disclosure reactions, and PTG) were then compared. The two groups differed significantly only on PTG scores, with disclosers (M = 21.02, SD = 6.29) reporting more growth than non-disclosers (M = 14.80, SD = 6.54), $t(72) = 3.39$, $p < .01$). See Table 2.

To examine whether those that disclosed about negative consequences of the event (N = 54) differed from those that did not (N = 21) on variables of interest, independent samples t-tests were run between these groups. There were no significant differences between groups. See Table 3.

To evaluate the pattern by which people wanted to disclose, and did or did not disclose, χ^2 analyses were conducted. All participants were included in the analysis of desire to disclose and actual disclosure about PTG, χ^2 (1, N=76) = 26.96, $p < .001$. See Table 4. There is a relationship between desire to disclose and actual disclosure about

growth such that those that desired to disclose were significantly more likely to disclose, and those that did not desire to disclose were less likely to disclose. It is worth noting that many people who did not want to disclose, did; 40.9% of those that did not want to disclose about PTG, did disclose.

One participant was excluded from the analysis of disclosure about negative consequences of the event because he was missing data for both of the items, so the analyses were conducted with 75 of the 76 participants, χ^2 (1, N = 75) = 19.19, $p < .001$. See Table 5. There is a relationship between desire to disclose and actual disclosure about negative consequences such that those that desired to disclose were significantly more likely to disclose, and those that did not desire to disclose were less likely to disclose. As with disclosures about event-related growth, some participants who did not want to disclose about negative consequences of the event, often did anyway. Indeed, almost half (47.1%) of participants who did not want to disclose about negative consequences, did anyway.

A χ^2 analysis was conducted to assess possible differences between desire to disclose about growth, and desire to disclose about negative consequences of the event, χ^2(1, N = 75) = .59, $p > .05$. See Table 6. Desire to disclose about growth and desire to disclose about negative consequences of the event were not meaningfully related.

A χ^2 analysis to assess for a relationship between actual disclosure about growth and actual disclosure about negative consequences was also performed χ^2 (1, N = 75) = 12.01, $p < .001$. See Table 7. These findings indicate that actual disclosure about growth is associated with actual disclosure about negative consequences, such that participants

that engaged in one form of disclosure were more likely to engage in the other, and those that did not engage in one form of disclosure were less likely to disclose in the other.

Focal Variables: Research Hypotheses

The first 4 hypotheses focus on relationships of deliberate and intrusive rumination with reactions to disclosures. Deliberate rumination was significantly positively associated with intrusive rumination (N = 75, r = .52, p < .001). Participants who endorsed intrusive rumination about the event were more likely to endorse deliberate rumination, and vice versa.

Hypothesis 1 posited that deliberate rumination would be positively associated with more helpful responses to PTG disclosures. There was instead a significant negative correlation between deliberate rumination and PTG disclosure reactions (N = 60, r = -.39, p < .01) such that more helpful reactions to disclosures were associated with less deliberate rumination.

To evaluate Hypothesis 2, that reactions to disclosures about negative consequences that are perceived as helpful would be positively associated with deliberate rumination, a correlational analysis between these variables was conducted. As negative consequence disclosure reactions were rated more positively, less deliberate rumination was endorsed (N = 54, r = -.43, p < .01). This was the opposite of the hypothesized relationship that deliberate rumination and responses to negative consequence disclosures (with higher scores indicating more supportive, helpful responses) would be significantly positively related.

Hypothesis 3 predicted a significant negative correlation between intrusive rumination and PTG disclosure reactions. This hypothesis was supported (N = 59, r = -

.45, $p < .001$), indicating that more supportive responses to PTG disclosures were associated with less intrusive rumination about the event.

Hypothesis 4 predicted a significant negative correlation between intrusive rumination and unhelpful reactions to negative consequence disclosures (N = 54, $r = -.36$, $p < .01$); this hypothesis was supported. These results indicate that more supportive responses to disclosures about negative consequences of the TBI were associated with less intrusive thinking about the event.

Hypothesis 5 predicted that reactions to disclosures about growth that were perceived as helpful would be positively associated with PTG. Hypothesis 5 was not supported (N = 60, $r = .09$, $p > .05$), as there was no observed significant relationship between PTG disclosure reactions and PTG.

Hypothesis 6 posited that disclosures about negative consequences that were perceived as helpful would be positively associated with PTG (though less strongly than reactions to disclosures about growth). Hypothesis 6 was not supported (N = 54, $r = .02$, $p > .05$) as there was no significant relationship between reactions to negative consequence disclosures and growth.

Hypothesis 7 predicted that deliberate rumination would be positively associated with PTG; this hypothesis was supported (N = 76, $r = .39$, $p < .001$). This is consistent with previous findings that indicate that deliberate rumination is a significant positive predictor of PTG.

Previous studies have found little relationship between intrusive rumination and PTG after accounting for the role of deliberate rumination (Taku, Cann, Calhoun & Tedeschi, 2009). Though not a formal hypothesis, we assessed the relationship between

intrusive rumination and PTG via correlational analysis (N = 75, r = .21, p > .05); they were not significantly related.

To assess Hypothesis 8, that deliberate rumination, reactions to disclosures about negative consequences, and reactions to disclosures about growth together would be positive predictors of PTG, a stepwise regression analysis was performed. See Table 8. Only those participants who had disclosed about both negative and positive consequences of the injury were included (N = 48). First, years since injury and depression were entered as control variables; together they predicted 12% of the variance in PTG scores (R^2 = .12, F(2, 45) = 3.18, p = .05). In the first step years since injury was a significant predictor while depression was not. Next, deliberate rumination was entered because previous research (e.g., Linley & Joseph, 1996; Taku, Cann, Tedeschi & Calhoun, 2009) has demonstrated that deliberate rumination and PTG are positively correlated. Less is known about the role of disclosure in the process of PTG development, and we were interested in determining how much disclosure might influence growth after controlling for a known strong predictor. Deliberate rumination predicted an additional 13% of the variance (R^2 = .26, F(3, 44) = 5.10, p < .01), a significant change (change in R^2 = .13, F change = 7.94, p < .01). In the second step, years since injury and deliberate rumination were significant predictors while depression was not. In the third step, reactions to disclosures about growth and reactions to disclosures about negative consequences were entered simultaneously and together predicted an additional 10% of the variance (R^2 = .36, F(5,42) = 4.71, p < .01), a significant change (change in R^2 = .10, F change = 3.31, p < .05). See Table 4. In this final model only deliberate rumination and PTG disclosure reaction scores were significant predictors of PTG, while years since injury, depression,

and reactions to negative consequence disclosure scores were not significant. In this sample, depression was not a significant predictor of PTG in any step. Years since injury did impact PTG scores but once the contribution of deliberate rumination and reactions to negative consequence and PTG disclosures were considered, it became non-significant. Reactions to negative consequence disclosures did not meaningfully contribute to PTG. When considering depression, years since injury, deliberate rumination, reactions to negative consequence disclosures, and PTG disclosure reactions, only deliberate rumination and PTG disclosure reactions contributed meaningfully to PTG for this sample.

CHAPTER 5: DISCUSSION

Conclusions

The current study is one of only a few to examine the role of self-disclosure in the development of PTG, despite the rather important role that disclosure is believed to play in this process (Calhoun & Tedeschi, 1999, 2006; Tedeschi & Calhoun, 1995, 2004). Disclosure is believed to be prompted by rumination about the event as it may provide an opportunity for trauma survivors to obtain assistance in grappling with new information gleaned from the trauma experience. Disclosure met with helpful responses is theorized as important for the facilitation of growth because it helps the trauma survivor to make sense of what has happened and continue to engage in more productive and deliberate rumination needed to construct a more coherent narrative and make meaning of the event.

Let us first consider the differences between disclosers and non-disclosers. In this study people who disclosed about negative aspects of the trauma and those who did not were compared on focal variables (years since injury, depression, intrusive rumination, deliberate rumination, PTG disclosure reactions, and PTG); there were no significant differences between groups. PTG disclosers and non-disclosers were compared on focal variables (years since injury, depression, intrusive rumination, deliberate rumination, negative consequence disclosure reactions, and PTG) and differed only on PTG, with PTG disclosers reporting more PTG than PTG non-disclosers. This suggests that the very act of disclosing about PTG was related to higher PTG scores. Another interesting finding concerned the relationships between desire to disclose and actual disclosures. For

both PTG disclosure and negative consequences disclosure, those who expressed a desire to disclose usually did (over 90% in each case). However, among those who expressed a desire to not disclose, a large percentage eventually did disclose (over 40%). It may be that others draw disclosures out of the resistant, but few who want to disclose can be stopped. It is impossible to know exactly why these participants disclosed when they did not want to, but it is possible they experienced pressure from others. It is also possible that participants disclosed about PTG despite lack of desire because they wanted to comfort their loved ones, they were trying to "look on the bright side," or because they felt it was more acceptable to discuss positive versus negative consequences.

Disclosures met with helpful reactions should be especially powerful; according to the PTG model, reactions to disclosures are more likely to facilitate growth if they are supportive. Based on a previous study of disclosure and PTG in a sample of Japanese university students by Taku and colleagues (2009) and on findings from trauma disclosure literature (e.g., Lepore & Ituarte, 1999), disclosure reactions were predicted to help facilitate growth if they included supportive behaviors such as listening, encouraging, and sympathizing. Additionally, reactions that did not include confusion, disinterest, discomfort, or invalidation were predicted to facilitate growth; these were assessed via reverse scored items on the SDI.

In this sample, the final regression model, in which depression, years since injury, reactions to disclosures about negative consequences of the event, deliberate rumination, and reactions to PTG disclosures were entered to predict PTG, explained 36% of the variance in PTG scores, with deliberate rumination and reactions to PTG disclosures acting as the only significant predictors. Findings from this study suggest that individuals

who deliberately think about the event, and who receive supportive responses to growth disclosures, report more growth.

The current study builds upon our understanding of the relationship between rumination and self-disclosure in the context of PTG development. Findings from a previous study with college students who had experienced a traumatic event within the previous 2 years revealed that deliberate rumination soon after a trauma was associated with disclosure about both PTG and negative consequences of the event (Lindstrom et al., 2011). Participants who had disclosed about growth reported more deliberate rumination soon after the event and less current distress than trauma survivors that did not disclose about growth. That study provided some information on rumination and disclosure after a trauma, but only whether or not participants actually disclosed was evaluated. The PTG model, and indeed trauma disclosure literature more generally, emphasize the importance of how disclosures are received by listeners. The current study expanded upon existing literature by examining desire to disclose, actual disclosure, and the quality of reactions to disclosures as reported by trauma survivors.

In the current study we had predicted a positive relationship between deliberate rumination and reactions to both PTG and negative consequence disclosures. This prediction was based on the assumption that deliberate rumination about the event would prompt disclosures, and helpful reactions to disclosures would facilitate more deliberate rumination about the event. The results indicated that the opposite result was true: deliberate rumination was significantly negatively associated with helpfulness of reactions to disclosures about growth, and helpfulness of reactions to negative consequence disclosures. Based on the findings of the current study, it is reasonable to

consider the possibility that helpful responses to disclosures reduce both deliberate and intrusive rumination. Taking deliberate rumination by itself, this seems more plausible than the opposite interpretation, that individuals who did not think deliberately about the event, but did disclose about growth, experienced more helpful reactions to disclosures. Perhaps helpful responses to disclosures rendered additional rumination less necessary because helpful reactions to disclosures may facilitate resolution of the emotional distress that prompted both intrusive and deliberate rumination to occur. Certainly, the negative relationship between reactions to disclosures and intrusive rumination would seem to support this argument. Indeed, the findings from the regression model would suggest that disclosure without deliberate rumination is not likely to facilitate growth, while helpful responses to growth disclosures in combination with deliberate rumination, are. Finally, we asked only about recent (within the past 2 weeks) intrusive and deliberate rumination but asked about disclosure experiences post-TBI more generally. While we cannot be entirely certain, an argument can be made that the disclosures had to precede at least some, if not all, of the rumination reported, unless all disclosures occurred in the past 2 weeks, too. This seems rather unlikely considering that participants had sustained their injuries at least 3 years prior to the study, at minimum.

Intrusive rumination was hypothesized to be negatively associated with helpful reactions to both kinds of disclosures because helpful disclosure reactions should alleviate some of the internal distress driving intrusive rumination. Consistent with previous findings (Klein, 2002; Lange et al., 2002) these hypotheses were supported; more supportive responses to both PTG and negative consequence disclosures were associated with lower self-reported intrusive thoughts about the event. This demonstrates

that helpful reactions to both PTG and negative consequence disclosures facilitate improved adjustment to trauma by reducing unwanted, distressing thoughts about the event.

We had hypothesized a direct positive relationship between reactions to PTG disclosures and PTG such that more helpful reactions to PTG disclosures would be significantly positively correlated with PTG scores; this hypothesis was not supported. Though positive, the relationship between reactions to PTG disclosures and PTG scores was not significant. However, when predicting PTG scores in the regression model which also accounted for depression, years since injury, reactions to negative consequence disclosures, and deliberate rumination as predictors, helpful reactions to PTG disclosures were a significant positive predictor. Deliberate rumination was the only other significant predictor in this model, suggesting that perhaps reactions to PTG disclosures are important in facilitating growth when individuals are still engaged in deliberate processing of the experience.

We had predicted that negative consequence reaction scores would be positively correlated with PTG scores such that more helpful reactions to disclosures about negative consequences of TBI would be associated with higher growth scores; this hypothesis was not supported. Neither the simple correlation nor the partial correlations in the regression model revealed any relationship between responses to disclosures about negative consequences of the event and PTG. Negative consequence disclosure reactions were not a significant predictor in the final model predicting PTG, unlike reactions to PTG disclosures. This finding serves as preliminary support for this aspect of the model of PTG, which emphasizes the importance of reactions to disclosures about growth over

the importance of reactions to disclosures about negative consequences in the growth process. Helpful responses to negative consequence disclosures might instead predict less distress, which is typically unrelated or weakly related to PTG (e.g., Cordova et al., 2001).

Deliberate rumination was, as hypothesized, a direct positive correlate of PTG. This is consistent with previous research (Hallam & Morris, 2014; Lindstrom et al., 2011; Triplett et al., 2012). This finding, taken along with the abovementioned findings, suggests that deliberate rumination is sufficient for growth to occur, at least in the context of the variables examined in this study. Helpful reactions to PTG disclosures, on the other hand, were not significantly associated with growth without being accompanied by deliberate rumination. It is difficult to know exactly what the abovementioned findings indicate because this was a retrospective study. Ideally, we would have measures of rumination soon after the event, disclosure soon after the event, and then administer these measures again later on. This approach would help to determine the direction of the relationship between rumination and self-disclosure. The theorized process is such that challenge to core beliefs prompts rumination, which often leads to disclosure. Helpful disclosures are then believed to facilitate more deliberate and less intrusive thinking. This is proposed as a bidirectional relationship such that rumination and disclosure often occur concurrently.

In this study current depression was positively associated with both intrusive and deliberate rumination about the TBI. These findings are consistent with the extensive depression literature that suggests that cognitive processing of information plays an important role in depression. In other words, it seems likely that people with certain,

more ruminative coping styles, who are more likely to develop depression, would also be more likely to engage in rumination about a traumatic event. The findings that depression was negatively related to reactions to both growth disclosures and negative consequence disclosure reactions support the well-established concepts of recovery from trauma. Individuals who discuss difficult times with others tend to do so as a means of coping, and as a way of recovering from distress. It makes sense that helpful responses to disclosures, which require talking to have occurred, would be associated with less depression. It is also quite possible that trauma survivors who experience fewer depressive symptoms are more engaged with their social networks and may have better social skills, which may make disclosure more likely, and more likely to be met with helpful responses. Conversely, positive support networks in which empathic, supportive others are readily available may serve as a buffer against depression and its symptoms.

Findings from analyses of the indicators of injury severity (i.e., GCS scores and posttraumatic amnesia) and focal variables suggest that there was little relationship between injury severity and the major constructs being measured. It was important to assess these relationships because a unique aspect of this sample is that all participants had sustained injuries that have almost inevitably compromised at least some aspects of cognitive functioning (Dikmen et al., 1995; Goldstein & Levin, 1996). Memory is often compromised after TBI. It is one of the most problematic symptoms reported by TBI survivors and their families (Oddy et al., 1985) and it tends to persist despite initial improvement (Zec et al., 2001). This is likely to compromise the ability to recall experiences of rumination and disclosures, among other things. Efforts were made to

minimize the impact of this deficit by asking only about recent intrusive and deliberate rumination.

It is also possible that memory problems may have made it more difficult for participants to reliably respond to the questions because of short term or working memory deficits. Participants may have had difficulty holding the response options and items in mind, as these memory impairments are not uncommon in TBI survivors (Christodolou et al., 2001). Moreover, research suggests that TBI survivors require more time to access short term memory and use it to respond to oral questions (Haut et al., 1990). Efforts were made to reduce need for reliance on short term memory. Participants were encouraged at the outset of the study to ask for reminders as needed. The researcher had never administered these inventories over the phone with non-brain injured individuals so there was not a preexisting expectation of how long it should take. When designing the study, the researcher consulted with experts who specialize in research with brain injured and otherwise cognitively compromised populations to determine how long the battery might take, and informed participants that it would take between 30-40 minutes. It more often took between 10-20 minutes, suggesting that processing difficulties might not have been a serious concern in this sample. Additionally, the researcher provided unsolicited reminders, and more often than not repeated the response options for each items unless participants clearly knew their options or commented on the redundancy.

Limitations

As with any study, the current research has its limitations. Although it is difficult, if not impossible, to recruit future trauma survivors to participate in a study, it would be

preferable in a sample of TBI survivors to evaluate them as soon as possible after the injury and then continue to follow them as they recovered. This would allow assessment of rumination and disclosure over time, which would help to clarify the exact nature of the relationship between these two factors as they pertain to the development of PTG. For instance, early supportive responses to disclosures may facilitate more disclosures, and more deliberate and less intrusive rumination. On the other hand, early disclosures met with unsupportive responses may lead to fewer disclosures, and more intrusive rumination. Ongoing assessment of these factors is needed to help to begin to answer these questions.

Other limitations include the nature of the sample. This was a relatively small sample, most of whom were male (58/76; 76.3%). However, males are considerably more likely to sustain a TBI than women, making them more likely to be recruited into the original study. In addition, the current study sample is fairly consistent with the national sample of TBIMS registrants, wherein 74% of the more than 10,000 participants are male. In this respect, then, the sample is fairly representative of the population of the main study. It is worth noting that this is not a representative sample of the general population of the United States; according to the US National Census Bureau (2010) 50.8% of Americans were female and 49.2% were male at time of data collection. Application of the findings from the current study to females should be done with the understanding that women were underrepresented in this sample. Another limitation of the sample is its racial composition; 64/76 (84.2%) of the sample were White. By comparison, only 67% of the TBIMS registry identified as White, 20% identified as Black, 9% identified as Hispanic, 3% as Asian, and 1% were categorized as 'Other.'

Though underrepresented, the sample included 14.5% Black participants, and 1% 'Other.' According to US National Census Bureau estimates from 2013, 62.6% of Americans identified as White, 13.2% of Americans identified as Black, and 17.1% identified as Hispanic. Based on these numbers, it may be most important to use caution when generalizing findings to non-Whites, especially individuals who identify as Hispanic.

It is important to consider how the current study participants compared to the national TBIMS registry with respect to age. Participants in the TBIMS registry were somewhat older than current study participants at time of injury (M = 39.78 vs. M = 35.66) and range in age at time of injury was greater (16-86 years old) compared to study participants' range in age at time of injury (16-77). Marital status at time of injury was comparable. 47% of TBIMS registry participants were single at time of injury while 48.7% of the current study's participants were single at injury. 32% of TBIMS registry participants were married at time of injury, while 28.9% of current study participants were married at time of injury. 16% of TBIMS registry participants were divorced or separated at time of injury while 19.8% of current study participants were divorced or separated at time of injury. 5% of TBIMS registry participants were widowed when they sustained their injuries, while 2.6% of current study participants were widowed when they sustained their injuries. These numbers suggest that current study participants were fairly similar to the national database of TBI survivors in terms of both age and marital status at time of injury.

Finally, all participants in the current study sustained traumatic brain injuries. It is possible that the findings from this study are specific to TBI survivors; replication of these findings with other trauma populations is needed to ensure generalizability.

Future Directions

Previous studies have supported the importance of core belief challenge and deliberate rumination in the development of PTG but these studies have not included evaluations of self-disclosure. The current findings show that disclosing about growth experiences is associated with higher posttraumatic growth, and that supportive responses to disclosures might, in context, also add to the growth experience. Future studies would ideally be longitudinal and include core belief challenge, rumination, and disclosure variables in order to provide a richer understanding of the interplay of these three key theoretical factors. It is possible the exact nature of the relationship is being missed by not evaluating these variables all in the same sample and not examining their potentially changing relationships over time as participants process their traumatic experience.

Findings from this study have implications for clinical intervention with traumatized populations. Specifically, facilitation of deliberate thought about the trauma, as well as encouragement of consideration and discussion of positive consequences of the trauma may be likely to facilitate growth. It is important to provide an environment in which reactions to disclosures are supportive and empathic. As Calhoun and Tedeschi (1999; 2013) have suggested, clinicians can provide this type of feedback in order to help facilitate growth. It may also be useful to include loved ones in such sessions so that they can learn how to provide helpful responses to disclosures, too.

Qualitative studies with trauma survivors allowing for spontaneous reporting of helpful responses may reveal other aspects of reactions to disclosures that are helpful in facilitating growth. In this study, we asked participants to rate the helpfulness of the disclosure reactions of "loved ones." It is possible, perhaps even likely, that trauma survivors get helpful responses from some people and not others. Future studies might consider allowing for participants to separate certain "loved ones" from others, as there may be a more complex picture. In other words, participants may want to report having had some people react with understanding, and other people with misunderstanding. Indeed, people get different kinds of support from different sources in their social networks. Allowing for participants to report in more detail how disclosures were received, and by whom, may reveal additional layers that help inform this area of study.

Despite its limitations, the current study provides valuable new information about the role of self-disclosure in the posttraumatic growth process. As hypothesized, disclosures about PTG that were met with responses that involved listening, encouraging, and validating and did not include confusion, disinterest, or discomfort were associated with higher self-reported growth. Deliberate rumination was a strong positive predictor of PTG in this study, as it was in previous studies. However, self-disclosures about growth that were met with helpful responses were associated with more self-reported posttraumatic growth, even after controlling for deliberate rumination. The current study also provided new information about desire to disclose and actual disclosure of both positive consequences of trauma (i.e., PTG) and negative consequences of disclosure, as well as providing an opportunity to compare those that disclosed about the traumatic event with those who did not. All of these findings should provide guidance for those

working with trauma survivors as they seek to facilitate the experience of growth. Specifically, when working with trauma survivors, deliberate rumination and disclosures about growth should be encouraged. Disclosures should be met with empathic, supportive and encouraging responses so as to facilitate growth.

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APPENDIX A: REQUESTED ARCHIVAL DATA

1. 101a Dates (and times)
2. 104 Sex
3. 105 Race
4. 107 Marital Status
5. 108 Primary person living with
6. 123 Premorbid limitations
7. 133a Cause of injury
8. 134 ETOH blood level at injury
9. 150 Neuropsychological Battery
10. 192a1 Premorbid drug use
11. 192a2 Premorbid alcohol use
12. 192g Premorbid psychiatric history
13. 801 Computes AGES
14. 804 Computed EDUCATION
15. 805 Computed EMPLOYMENT
16. 814 Computed INJURY YEAR
17. 815 Computed DAYS FROM INJURY to VARIOUS TIMEPOINTS
18. 821 Computed LENGTH OF REHAB STAY
19. 822 Computed NEUROPSYCH TESTING in WINDOW
20. 823 Computed ALCOHOL/DRUG PROBLEM USE
21. 824 Computed DAYS IN PTA

APPENDIX B: ADDITIONAL MEASURES

Patient Health Questionnaire – 2 (PHQ-2)

Over the past two weeks, how often have you been bothered by any of the following problems?

Little interest or pleasure in doing things.

0 = Not at all

1 = Several days

2 = More than half the days

3 = Nearly every day

Feeling down, depressed, or hopeless.

0 = Not at all

1 = Several days

2 = More than half the days

3 = Nearly every day

Total point score: _____

Kroenke, K., Spitzer, R.L., & Williams, J.B. (2003). The Patient Health Questionnaire-2: Validity of a two-item depression screener. *Med Care, 41*, 1284-1292.

Event-Related Rumination Inventory – Short Form (ERRI-SF – Recent Items only)

(Recent Intrusive Items)

After an experience like the one you reported, people sometimes, but not always, find themselves having thoughts about their experience even though they don't try to think about it. Indicate for the following items how often, if at all, you had the experiences described during the <u>past two weeks.</u>

1. I thought about the event when I did not mean to.

0 1 2 3

Not at all Rarely Sometimes Often

2. Thoughts about the event came to mind and I could not stop thinking about them.

0 1 2 3

Not at all Rarely Sometimes Often

3. I could not keep images or thoughts about the event from entering my mind.

0 1 2 3

Not at all Rarely Sometimes Often

4. Thoughts, memories, or images of the event came to mind even when I did not want them.

0 1 2 3

Not at all Rarely Sometimes Often

5. I found myself automatically thinking about what had happened.

0 1 2 3

Not at all Rarely Sometimes Often

ERRI-SF

(Recent Deliberate Items)

After an experience like the one you reported, people sometimes, but not always, deliberately and intentionally spend time thinking about their experience. Indicate for the following items how often, if at all, you deliberately spent time thinking about the issues indicated during the past two weeks.

6. I thought about whether I could find meaning from my experience.

0 1 2 3

Not at all Rarely Sometimes Often

7. I thought about whether changes in my life have come from dealing with my experience.

0 1 2 3

Not at all Rarely Sometimes Often

8. I thought about whether I have learned anything as a result of my experience.

0 1 2 3

Not at all Rarely Sometimes Often

9. I thought about whether the experience has changed my beliefs about the world.

0 1 2 3

Not at all Rarely Sometimes Often

10. I forced myself to deal with my feelings about the event.

0 1 2 3

Not at all Rarely Sometimes Often

Cann, A., Calhoun, L.G., Tedeschi, R.G., Triplett, K. N., Vishnevsky, T., & Lindstrom, C. M. (2011). Assessing posttraumatic cognitive processes: The Event Related Rumination Inventory. Anxiety, Stress & Coping, 24, 137 – 156. First published on: 15 November 2010 (iFirst).

Self-Disclosure Inventory (SDI)
Negative Consequences Disclosure Scale (NCDS)
([1] = inspired by Lepore & Ituarte, 1999 [2] = inspired by Taku et al., 2009)

In responding to the following set of questions, please have in mind the most important people in your life – I will refer to them as your "loved ones."

1. Did you ever find yourself wanting to discuss negative consequences of your injury with your loved ones?

   _____Yes OR _____No

2. Sometimes, did you actually discuss negative consequences of your injury with your loved ones?

   _____Yes OR **_____No – Discontinue Measure**

Please respond to the following statements with:

0-Not at all, 1-Rarely, 2-Sometimes, 3-Often

(Remind of scale as needed)

When I talked about negative consequences of my injury:

3. my loved ones were uncomfortable.[1] ®

0 1 2 3

Not at all Rarely Sometimes Often

4. my loved ones listened to me.[2]

0 1 2 3

Not at all Rarely Sometimes Often

5. my loved ones tried to change the subject.[1] ®

0 1 2 3

Not at all Rarely Sometimes Often

6. my loved ones sympathized with me.[2]

0 1 2 3

Not at all Rarely Sometimes Often

7. my loved ones minimized (downplayed) my problems.[1] ®

0 1 2 3

Not at all Rarely Sometimes Often

8. my loved ones encouraged me.[2]

0 1 2 3

Not at all Rarely Sometimes Often

9. my loved ones seemed confused.[2] ®

0 1 2 3

Not at all Rarely Sometimes Often

10. my loved ones shared about difficult situations they'd faced.[2]

0 1 2 3

Not at all Rarely Sometimes Often

11. my loved ones didn't want to hear about it.[1] ®

0 1 2 3

Not at all Rarely Sometimes Often

Self-Disclosure Inventory (SDI)
Posttraumatic Growth Disclosure Scale (PTGDS)
([1] = inspired by Lepore & Ituarte, 1999 [2] = inspired by Taku et al., 2009)

In responding to the following set of questions, please have in mind the most important people in your life – I will refer to them as your "loved ones."

1. Did you ever find yourself wanting to discuss positive things that came from struggling with your injury with your loved ones?
   _____Yes OR _____No

2. Sometimes, did you actually discuss positive things that came from struggling with your injury with your loved ones?

   _____Yes OR **_____No – Discontinue Measure**

Please respond to the following statements with:

0-Not at all, 1-Rarely, 2-Sometimes, 3-Often

(Remind of scale as needed) (Circle response)

When I talked about positive things that came from struggling with my injury:

3. my loved ones were uncomfortable. ®

0 1 2 3

Not at all Rarely Sometimes Often

4. my loved ones listened to me.

0 1 2 3

Not at all Rarely Sometimes Often

5. my loved ones tried to change the subject. ®

0 1 2 3

Not at all Rarely Sometimes Often

6. my loved ones understood.

0 1 2 3

Not at all Rarely Sometimes Often

7. my loved ones minimized (downplayed) my problems. ®

0 1 2 3

Not at all Rarely Sometimes Often

8. my loved ones encouraged me.

0 1 2 3

Not at all Rarely Sometimes Often

9. my loved ones seemed confused. ®

0 1 2 3

Not at all Rarely Sometimes Often

10. my loved ones shared about times when they found positive things in difficult situations.

0 1 2 3

Not at all Rarely Sometimes Often

11. my loved ones didn't want to her about it. ®

0 1 2 3

Not at all Rarely Sometimes Often

® indicates reverse-scored items

Posttraumatic Growth Inventory –Short Form (PTGI-SF) - Modified

Indicate for each of the statements below the degree to which this change occurred in your life as a result of your injury, using the following scale.

<u>Note to investigators</u> – you will need to format the items so that participants have a way of responding to each one. The procedure we recommend is to place the numerical values of the rating scale after each item.

In addition, the codes in parentheses after each item should be removed before administering the measure.

0= Not at all

1= Small change

2= Moderate change

3= Great deal of change

1. I changed my priorities about what is important in life. (V-1)
2. I have a greater appreciation for the value of my own life. (V-2)
3. I am able to do better things with my life. (II-11)
4. I have a better understanding of spiritual matters. (IV-5)
5. I have a greater sense of closeness with others. (I-8)
6. I established a new path for my life. (II-7)
7. I know better that I can handle difficulties. (III-10)
8. I have a stronger religious faith. (IV-18)
9. I discovered that I'm stronger than I thought I was. (III-19)
10. I learned a great deal about how wonderful people are. (I-20)

Note: Scale is scored by adding all responses. Factors are scored by adding responses to items on each factor. Items to which factors belong are not listed on form administered to participants

The Roman numerals in the parentheses following each item denote the factor and the Arabic numerals indicate the item number from the original 21-item PTGI.

PTGI Factors

Factor I: Relating to Others

Factor II: New Possibilities

Factor III: Personal Strength

Factor IV: Spiritual Change

Factor V: Appreciation of Life

Cann, A., Calhoun, L.G., Tedeschi, R.G., Taku, K., Vishnevsky, T., Triplett, K.N., & Danhauer, S.C. (2010). A short form of the Posttraumatic Growth Inventory. *Anxiety, Stress & Coping, 23,* 127-137.

APPENDIX C: TABLES

Table 1*:* Descriptive Statistics and Zero-Order Correlations among Focal Variables

	M	*SD*	1	2	3	4	5	6
1. Years since Injury	6.75	2.95						
2. Depression	1.69	1.92	-.10					
3. Intrusive Rumination	5.37	5.22	-.09	.43**				
4. Deliberate Rumination	7.89	4.48	-.13	.46**	.52**			
5. PTG Disclosure	20.17	3.29	-.26*	-.41**	-.45**	-.39*		
6. Negative Consequence Disc.	18.20	5.06	-.09	-.60**	-.36*	-.43*	.79**	
7. PTG	19.82	6.82	-.35*	.12	.21	.39**	.09	.02

†p < .05, *p < .01, **p < .001

Note. Possible Range of Scores for Focal Variables: Years since Injury (3-12 years); Depression (0-6), Intrusive Rumination (0-15), Deliberate Rumination (0-15); PTG Disclosure Reaction Scores (0-24), Negative Consequence Disclosure Reaction Scores (0-24), PTGI-SF Scores (0-30). N was different for many of the analyses; N for each correlational analysis is reported in the text.

Table 2: Independent Samples *t*-tests for Posttraumatic Growth Disclosers and Non-Disclosers

	Posttraumatic Growth Disclosure								
	Disclosers			Non-Disclosers					
	M	*SD*	n	*M*	*SD*	n	*t*	*df*	*p*
Years since Injury	6.45	2.85	60	7.88	3.16	16	1.74	74	.07
Depression[NA]	1.47	1.75	59	2.50	2.37	16	1.62	19.64	.12
Intrusive Rumination	5.61	5.23	59	4.50	5.28	16	.75	73	.46
Deliberate Rumination	8.22	4.48	60	6.69	4.39	16	1.22	74	.23
Negative Disc Reactions[NA]	18.65	4.59	48	14.67	7.53	6	1.27	5.48	.26
PTG	21.17	6.34	60	14.75	6.32	16	3.60	74	.001

Note: NA = Equal Variances Not Assumed.

Possible Range of Scores for Focal Variables: Years since Injury (3-12 years); Depression (0-6), Intrusive Rumination (0-15), Deliberate Rumination (0-15); PTG Disclosure Reaction Scores (0-24), Negative Consequence Disclosure Reaction Scores (0-24), PTGI-SF Scores (0-30). N was different for many of the analyses; N for each correlational analysis is reported in the text.

Table 3: Independent Samples *t*-tests for Negative Consequence Disclosers and Non-Disclosers

	Negative Consequence Disclosure								
	Disclosers			Non-Disclosers					
	M	*SD*	n	*M*	*SD*	n	*t*	*df*	*p*
Years since Injury	6.63	3.15	54	7.05	2.50	21	.54	73	.59
Depression[NA]	1.65	1.89	54	1.81	2.06	21	.32	73	.75
Intrusive Rumination	5.74	5.44	54	4.43	4.62	21	.98	73	.33
Deliberate Rumination	8.50	4.47	54	6.33	4.34	21	1.90	73	.06
PTG Disclosure Reactions[NA]	20.44	3.16	48	19.36	3.75	11	.98	57	.33
PTG	20.46	6.56	54	17.67	7.02	21	1.63	73	.11

Note: NA = Equal Variances Not Assumed

Note. Possible Range of Scores for Focal Variables: Years since Injury (3-12 years); Depression (0-6), Intrusive Rumination (0-15), Deliberate Rumination (0-15); PTG Disclosure Reaction Scores (0-24), Negative Consequence Disclosure Reaction Scores (0-24), PTGI-SF Scores (0-30). N was different for many of the analyses; N for each correlational analysis is reported in the text.

Table 4: χ^2 Analysis of Desire to Disclose and Actual Disclosure of PTG

		Wanted to Disclose PTG	
		No	Yes
Disclosed PTG	No	13 (59.1%)	3 (5.7%)
	Yes	9 (40.9%)	51 (94.3%)
		22 (100%)	54 (100%)

Table 5: χ^2 Analysis of Desire to Disclose and Actual Disclosure of Negative Consequences

		Wanted to Disclose Negative Consequences	
		No	Yes
Disclosed Negative Consequences	No	18 (52.9%)	3 (7.3%)
	Yes	16 (47.1%)	38 (92.7%)
		34 (100%)	41 (100%)

Table 6: χ^2 Analysis for Desire to Disclose PTG and Negative Consequences

		Wanted to Disclose Negative Consequences	
		No	Yes
Wanted to Disclose PTG	No	11 (32.4%)	10 (24.4%)
	Yes	23 (67.6%)	31 (75.6%)
		34 (100%)	41 (100%)

Table 7: χ^2 Analysis for Actual Disclosure of PTG and Negative Consequences

		Disclosed Negative Consequences	
		No	Yes
Disclosed PTG	No	10 (47.6%)	6 (11.1%)
	Yes	11 (52.4%)	48 (88.9%)
		21 (100%)	54 (100%)

Table 8: Hierarchical Multiple Regression Predicting Posttraumatic Growth

Model	*b*	*SE*	β	R^2	ΔR^2
Step 1				.12	.12
(Intercept)	24.23	2.26			
Years since Injury	-.62†	.29	-.30		
Depression	.68	.57	.17		
Step 2				.26*	.13*
(Intercept)	20.15	2.55			
Years since Injury	-.59†	.27	-.28		
Depression	-.26	.62	-.07		
Deliberate Rumination	.61*	.22	.43		
Step 3				.36*	.10†
(Intercept)	1.97	7.67			
Years since Injury	-.34	.28	-.16		
Depression	-.12	.64	-.03		
Deliberate Rumination	.74*	.22	.53		
PTG Disclosure	.92†	.43	.45		
Negative Consequence Disc.	-.19	.31	-.13		

†p < .05, *p < .01, **p < .001