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STRESS, APPRAISAL AND COPING FOLLOWING TRAUMATIC BRAIN INJURY: THE IMPACT OF PERCEIVED STRESS, HOPE, PROBLEM-SOLVING APPRAISAL, AND DEPRESSION ON ADJUSTMENT

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ABSTRACT

STRESS, APPRAISAL AND COPING FOLLOWING TRAUMATIC BRAIN INJURY: THE IMPACT OF PERCEIVED STRESS, HOPE, PROBLEM-SOLVING APPRAISAL, AND DEPRESSION ON ADJUSTMENT.

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The present study tested a portion of the stress, appraisal and coping (SAC) model proposed by Godfrey, Knight, and Partridge (1996). Using data gathered from 94 individuals who had sustained a traumatic brain injury, path analysis results indicated that a model based on Godfrey et al.'s (1996) SAC model did not adequately fit the sample data. Based on relevant statistical output, previous research and theory, a re-specified model was tested. The final model was shown to meet common statistical measures for establishing model fit. The final model indicated that higher levels of perceived stress were predictive of higher levels of self-reported depression, higher levels of depression were predictive of lower levels of dispositional hope, and dispositional hope was predictive of increased life satisfaction and work productivity. The present findings hold implications for both research and clinical practice. The findings suggest the need for additional research to further clarify factors that contribute to emotional adjustment following traumatic brain injury.

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Chapter I

Introduction

Demographics of TBI

Traumatic brain injury (TBI) is defined as acquired damage to the brain that results when the head is hit, strikes a stationary object, or is shaken violently (Noble, Conley, Laski, & Noble, 1990). Brain injuries result from a rapid acceleration of a stationary or slower moving head by a moving object (acceleration injuries) or by a rapid deceleration of the head as it comes into contact with a stationary or slower moving object (deceleration injuries) (Levin, Benton, & Grossman, 1982). Not included in this definition are conditions resulting from perinatal conditions, damage due to oxygen depletion (i.e., hypoxia, anoxia), degenerative diseases, infectious diseases, tumors and stroke (Livneh & Antonak, 1997).

It is estimated that up to 1.5 million individuals sustain traumatic brain injuries in the United States each year. The age group most at risk for traumatic brain injury is individuals between 16 and 25 years of age (Leblanc, Hayden, & Paulman, 2000). Typically, those individuals at highest risk for incurring TBI are young, single males working in "blue collar" occupations or going to school, and who are prone to impulsive acts and excessive alcohol intake (Rimel & Jane, 1983). The percentage of persons sustaining TBI from motor vehicle accidents is greatest for those younger than 25, whereas the percentage of persons who sustain brain injuries as the result of falls is highest for persons 56 years of age and over (Gordon, Mann, & Willer, 1993). Motor vehicle accidents generally result in acceleration-deceleration injuries, which are usually

more severe than injuries sustained in falls. Although older persons may generally sustain less severe injuries, they may be more vulnerable to the effects of trauma.

Impact of TBI

The impact of traumatic brain injury for an individual can range from mild physical disability to a pervasive set of physical, behavioral, and cognitive deficits that severely affect functioning throughout the individual's lifetime (Livneh & Antonak, 1997). Generally, symptoms following traumatic brain injury fall into one of three categories:

1. Physical symptoms (e.g., nausea, vomiting, dizziness, lethargy, or other sensory loss) that cannot be accounted for by peripheral injury or other causes;
2. Cognitive deficits (e.g., involving attention, concentration, perception or memory) that cannot be completely accounted for by emotional state or other causes; and
3. Behavioral change(s) (e.g., irritability, quickness to anger, or emotional lability) that cannot be accounted for by psychological reaction to physical or emotional stress or other causes (Committee on Mild Traumatic Brain Injury, 1993).

The most disabling of any of the dysfunctions seen after head injury, however, are psychosocial deficits (Rosenthal & Bond, 1990). While physical and cognitive impairments present difficulties, changes in personality and social behavior limit the capacity for successful return to work or school, independent living, and the re-

establishment of social relationships with peers and family members (Godfrey et al., 1996; Leblanc, Hayden, & Paulman, 2000).

Following TBI, many individuals may encounter difficulties performing everyday tasks such as organizing the preparation of meals, scheduling and keeping appointments, prioritizing and paying bills, analyzing costs and benefits of certain situations, and solving problems (Goldstein & Levin, 1987; Rath, Hennessy, & Diller, 2003). The most complex of all intellectual functions, problem solving, has been defined as a goal-directed cognitive activity that arises in situations for which no response is immediately apparent or available (Goldstein & Levin, 1987; Luria, 1966; Rath, Langenbahn, Sherr, & Diller, 2004). Because intact problem solving abilities are necessary to maintain a home, function in the community, and/or return to work, researchers have noted that problem solving deficits can prevent individuals from returning to productive personal and vocational lives (von Cramon & Matthes-von Cramon, 1991). In fact, some authors consider the remediation of problem-solving deficits following TBI to be a primary goal of neuropsychological rehabilitation (Cicerone et al., 2000).

In addition, family members of individuals with traumatic brain injury experience stress and adjustment problems related to sudden changes in their loved ones. Families can feel overwhelmed by the mental, behavioral, and personality changes which they report are more disruptive than the physical impairments associated with TBI (Springer, Farmer, & Bouman, 1997). In addition to adapting to the plethora of changes in the individual, family members are forced to deal with a change in their role within the family, often having to become both caretaker and primary provider. Consequently,

Brooks (1991) has suggested that the distress placed on the family is commensurate to that of the individual.

The long-term deficits following traumatic brain injury directly impact a person's interpersonal, vocational, and psychosocial functioning (Kay & Lezak, 1990). As a result, the need for long-term rehabilitation and care can result in excessive financial demands on the individual, their family, and society. The National Institutes of Health (NIH) Consensus Development Panel on Rehabilitation of Persons With Traumatic Brain Injury (1999) noted that traumatic brain injury places substantial burden on society due to its primary (e.g., medical costs) and secondary effects (e.g., loss of productivity). The cost of traumatic brain injury to society has been estimated to be up to $5 billion each year, for medical intervention, rehabilitation, residential care and lost earnings. This figure may even be higher if the costs incurred by family and friends are also taken into consideration (Noble et al., 1990).

Psychosocial Adjustment Following TBI

General consensus exists that the psychosocial deficits incurred from brain injuries last longer and are more difficult to treat than the physical sequelae of TBI (Ben Yishay, Silver, Piasetsky, & Rattok, 1987; Livingston, Brooks, & Bond, 1985). The process of adjustment to the effects of TBI is multifaceted and highly individualized to the person's life circumstances. The emotional difficulties, psychological reactions, and personality changes that accompany TBI are a complex combination of pre-morbid behavior, post-injury neurologic changes and social support systems (Livneh & Antonak, 1997). The effects of TBI can compromise an individual's ability to realistically assess

their current abilities, and reduce cognitive flexibility, thereby further complicating their adjustment to the resultant neurologic symptoms.

Prediction of outcome following TBI is difficult in the best of circumstances due to the number of factors that play an important contributory role in recovery. Symptoms of brain injury may or may not persist for varying lengths of time after such a neurological event. Individuals with traumatic brain injury could exhibit persistent emotional, cognitive, behavioral, and physical symptoms, alone or in combination, which may produce a functional disability. Therefore, further research is needed to facilitate understanding of the process of adjustment to post-TBI symptoms within a broad psychosocial context.

Statement of the Problem

Despite the consensus among researchers regarding the complex nature of psychosocial adjustment following traumatic brain injury, more research is needed that addresses the relationship between coping processes and adjustment following traumatic brain injury. A vast majority of studies examining adjustment following traumatic brain injury have focused on the report of symptoms and various outcomes such as return to work and quality of life. However, reported symptoms do not reflect brain impairment alone, and are not necessarily useful measures of recovery from brain injury; rather they reflect the interaction between the individual's brain functioning, stress management abilities, and perceived stress (Novack, Daniel, & Long, 1983).

Although high levels of emotional distress have been documented following TBI (e.g., Borgary, Prigatano, Kwasnica, & Rexer, 2003), the factors influencing the origins of psychosocial adjustment warrant further investigation. As previously noted, the

factors influencing outcome following brain injury are likely to be a complex combination of preinjury characteristics and post-injury psychosocial characteristics. In studies where authors cite TBI-related symptomatology as the cause for residual deficits it is likely that stress and/or poor stress management is a principal factor. Godfrey, Knight, and Partridge (1996) state "there is an urgent need for further research of this nature to examine the relationship between level of insight and coping style and to identify coping styles associated with adaptive adjustment following TBI. This knowledge could provide an empirical basis for the development of coping skills-based rehabilitation programs" (p. 34).

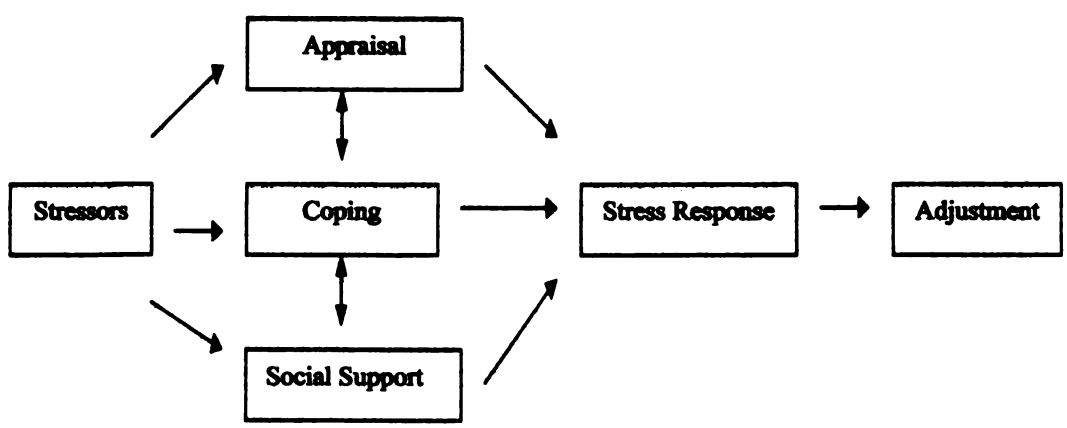
Theoretical Framework

Godfrey, Knight, and Partridge (1996) proposed a Stress-Appraisal-Coping (SAC) model for conceptualizing adjustment following traumatic brain injury based on Lazarus and Folkman's (1985) stress and coping model. These theorists hypothesize that individuals experience emotional distress when they appraise their environmental demands as exceeding their personal and socially available coping resources. TBI may invoke such conditions because neuropsychological impairment compromises the individual's pursuit of important preinjury goals.

Godfrey et al.'s (1996) model is designed to account for the large individual differences in emotional adjustment to seemingly similar injuries. As shown in Figure 1, the pertinent variables of the model include stressors, appraisal, coping, social support, stress response, and adjustment. Stressors are defined as the demands placed on individuals in their everyday lives. Appraisal is comprised of two processes: primary appraisal and secondary appraisal. Primary appraisal is concerned with the individual's

perception of the degree of threat a situation poses. Secondary appraisal is the choice of a coping response from an individual's repertoire and skills. Coping skills have been defined as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984). Stress responses are an individual's adverse psychological reactions to the demands placed on him or her. Godfrey et al. (1996) state that adjustment refers to three domains: work and social living, morale and life satisfaction, and somatic health. Further, work and social living reflect the cumulative effects of the individual's appraisal and coping efforts; while morale and life satisfaction reflect an individual's satisfaction in achieving his or her expected life outcomes. Finally, somatic health is a product of neurochemical stress reactions, harmful coping, and impeding adaptive health behavior (Godfrey et al., 1996).

Figure 1. Godfrey, Knight, and Partridge (1996) Stress-Appraisal-Coping Model of Emotional Adjustment to Traumatic Brain Injury.



Researchers have used Godfrey et al.'s (1996) SAC model with various populations including students and diverse clinical samples. Studies using the SAC

model have demonstrated that coping strategies characterized as active, interpersonal, and problem-focused have tended to be associated with more positive outcomes, whereas strategies of escape and avoidance are more likely to be associated with higher levels of depression and anxiety (Curran, Ponsford, & Crowe, 2000). Studies examining coping following traumatic brain injury have found similar results. For example, Moore and Stambrook (1992) found that higher use of self-controlling and positive reappraisal coping strategies was associated with lower mood disturbances and fewer physical difficulties.

Significance of the Problem

The long-term consequences of TBI have a negative impact on the psychosocial functioning of both the individual and his/her family. As such, Godfrey et al. (1996) suggest that cognitive moderators and coping strategies can be powerful determinants of recovery. It has been demonstrated that stress and coping behaviors impact a person's psychosocial adjustment following TBI (Moore & Stambrook, 1992). Given this fact, researchers are currently emphasizing the importance of focusing on an individual's stress, appraisal, and coping processes following traumatic brain injury (Godfrey et al., 1996). Research that addresses an individual's stress, appraisal, and coping processes following traumatic brain injury would add to our understanding of the role of psychological processes in adjustment and suggest methods for facilitating successful adjustment. The identification of coping strategies that promote positive adjustment may provide clues to professionals about how to best help individuals following TBI. A significant advantage of conceptualizing adjustment to TBI within a Stress-Appraisal-

Coping model is that the model highlights the role of factors that mediate adjustment and that may be targeted therapeutically.

Purpose of the Study

The present study was designed to examine the cognitively moderated stress, appraisal, and coping processes individuals engage in following traumatic brain injury. As such, a portion of Godfrey et al.'s (1996) model was selected as a theoretical framework for the present study. The present study tested a portion of the stress, appraisal and coping model proposed by Godfrey et al. (1996) using data from a sample of individuals who have sustained traumatic brain injuries. The modification of Godfrey et al.'s (1996) model was made in an effort to specifically target the cognitive based appraisal and coping processes that impact an individual's emotional adjustment following TBI. The hypothesized model tested in this study is shown in Figure 2. The long-term utility of this study is to aid in the development of coping skills-based rehabilitation programs.

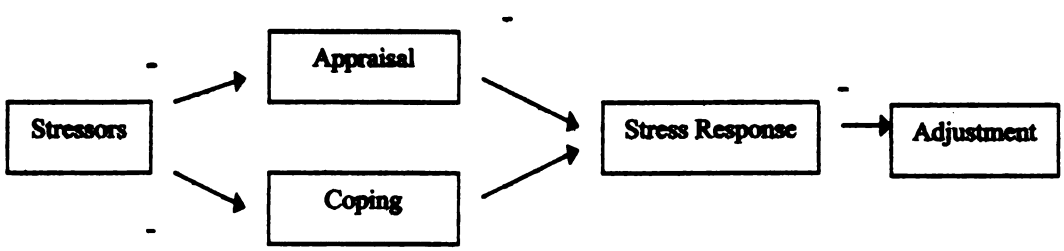


Figure 2. Hypothesized Structural Stress, Appraisal, Coping, and Adjustment Model.

Research Hypothesis

Based on Godfrey et al's (1996) stress, appraisal, and coping model, it is hypothesized that the theoretical model shown in Figure 2 will fit the sample data.

Chapter II

Review of the Literature

Brain injury is widely recognized as a major public health problem in the United States (Jennett, 1990). Despite the consensus among researchers regarding the complex nature of psychosocial adjustment following traumatic brain injury, there is still a need for research addressing the relationship between an individual's coping processes and functional adjustment following traumatic brain injury. The process of psychosocial adjustment to traumatic brain injury has been hypothesized by Godfrey et al. (1996) to include at least the following: neurologic symptoms, level of stress, coping behavior, and social support.

The purpose of the present study was to elucidate the psychological mechanisms that impact a person's adjustment following traumatic brain injury. To accomplish this goal, the present study tested a portion of the stress, appraisal and coping model proposed by Godfrey et al. (1996) within a sample of individuals who have sustained a traumatic brain injury. A significant advantage of conceptualizing adjustment to TBI with a stress-appraisal-coping model is that the model highlights the role of factors that mediate adjustment and may be targeted therapeutically. The potential long-term value of the present study is to aid in the development of coping skills-based rehabilitation programs. Accordingly, the literature review addresses the following topics: (a) overview of traumatic brain injury, (b) impact of brain injury, (c) psychosocial adjustment to traumatic brain injury, and (d) stress, appraisal and coping theory.

Overview of Traumatic Brain Injury

Incidence. Traumatic brain injury is a leading cause of death and lifelong disability among children and young adults in the United States. The incidence of brain injury is the number of cases that occur in a specific population during a specified period of time. The Center for Disease Control and Prevention (CDC) has estimated that each year, approximately 1.5 million Americans survive a traumatic brain injury (Sosin, Sniezek, & Thurman, 1996), and that 230,000 of these individuals are hospitalized due to their injury (CDC, 1998). Approximately 50,000 Americans die each year as a result of traumatic brain injury, representing one third of all injury-related deaths (Sosin, Sniezek, & Waxweiler, 1995).

A more common approach to reporting the incidence of brain injury is to report the number of injuries per 100,000 persons per year. Examination of brain injury incidence rates shows that average incidence rates vary between 95 (CDC, 1997) and 102.3 per 100,000. Consistent with these findings, a study examining the combined incidence rates in Colorado, Missouri, Oklahoma and Utah found that the incidence rates for these states was 102.1 per 100,000 population (MMWR, 1997). However, these rates are significantly lower than the 200 cases of TBI per 100,000 population annually that has been the standard figure for many years (Kosciulek, 1995).

Examining the rate of death associated with TBI also shows a declining trend. Sosin, Sniezek, and Waxweiler (1995) examined the rate of death following TBI between the years of 1979 and 1992. Their findings show an average of 19.3 per 100,000 US residents died following TBI in 1992. This average was significantly lower than the average in 1979 (24.6) indicating a 22% decline in rates of death associated with TBI

from 1979 and 1992. Studies also show a 51% decline in the rate of hospitalization following TBI between 1980 and 1995 (Thurman & Guerrero, 1999). Further, when examined by severity, mild TBI rates show the most significant decline (61%) during this period. The decline in rates may be a result of the occurrence of fewer traumatic brain injuries, but it also may be a result of changing counting methods, and better acute TBI treatment modalities (Thurman & Guerrero, 1999).

One method of putting the present incidence rate of TBI in perspective is to compare it to other prominent public health problems. For instance, the Centers for Disease Control (1992) estimates the annual incidence of AIDS cases to be 18 per 100,000 people. Despite the allocation of resources and attention to AIDS, the number of people who sustain TBI are potentially 6 times the number of new cases of HIV/AIDS each year.

Severity. To predict outcomes and to plan for rehabilitation needs, information about the severity of brain injury is essential (Sorentson & Kraus, 1991). The classification of TBI severity is a large problem in both clinical and research settings. Various methods for determining severity of TBI have been used. Alexander (1995) has argued for the importance of defining the severity of TBI by acute injury characteristics, rather than by the severity of symptoms at random points after trauma. The rationale behind this approach is that early physical, behavioral, and cognitive features are the best indicators of severity of the trauma, whereas later-stage symptomatology reflects a broader spectrum of factors including not only direct injury effects, but also emotional responses and adjustment to injury-related factors.

Commonly used methods to measure injury severity include depth of coma, duration of coma, duration of impaired consciousness, and duration of post-traumatic amnesia (PTA). The use of different classification systems has resulted in difficulty classifying brain injury severity across studies. The most widely used method of TBI classification relies on the Glasgow Coma Scale (GCS; Teasdale & Jennett, 1974). The GCS is an ordinal scale that measures a patient's responses within the domains of eye movement, motor response, and vocalization upon a five point rating scale. Patients with post-resuscitation GCS scores of 3-8 are classified as having sustained severe injuries, and patients with post-resuscitation GCS scores of 9-12 are classified as having suffered moderate injuries. Patients with GCS scores of 13-15 have been classified as having mild injuries.

In an effort to clarify confusion regarding the classification of mild traumatic brain injury, the Mild Traumatic Brain Injury Committee of the Head Injury Interdisciplinary Special Interest Group issued the following definition:

> A patient with mild head injury is a person who has had a traumatically induced physiological disruption of brain function, as manifested by at least one of the following: (a) any period of loss of consciousness; (b) any loss of memory for events immediately before or after the accident; (c) any alteration in mental state at the time of the accident (e.g., feeling dazed, disoriented, or confused); or (d) focal neurological deficit(s) that may or may not be transient; but where the severity of the injury does not exceed the following: (a) loss of consciousness of approximately 30 minutes or less; (b) after 30 minutes, an initial Glasgow Coma Scale

(GCS) of 13-15; and (c) posttraumatic amnesia (PTA) not greater than 24 hours (Mild Traumatic Brain Injury Committee, 1993).

Most studies estimate that 80 percent of brain injuries are mild and that moderate injuries compromise approximately 10 percent of all brain injuries (Sorenson & Kraus, 1991). Residual motor and neuropsychological deficits are compatible with moderate brain injury, as are major personality changes and family disruption. The remaining 10 percent of brain injuries, classified as severe, are marked by periods of coma that last for days or weeks and extensive physical and cognitive impairments as a result of brain stem damage (Kay & Lezak, 1990).

Risk Factors. Individuals at highest risk for incurring TBI are young, single males working in "blue collar" occupations or going to school, and who are prone to impulsive acts and excessive alcohol intake (Rimel & Jane, 1983). On average, males have significantly higher rates of TBI than females, with males experiencing 140 per 100,000 population and females 66 per 100,000. Incidence studies confirm that males age 15-24 have the highest rate of TBI (249.3 per 100,000 population), followed by males over the age of 75 (243.4 per 100,000; Centers for Disease Control and Prevention, 1997).

The most frequent cause of TBI is motor vehicle accidents, followed by falls, firearms and non-firearm assaults (Centers for Disease Control and Prevention, 1997). The percentage of persons sustaining TBI from motor vehicle accidents is greatest for those younger than 25. Moreover, the percentage of TBI as the result of falls is highest for persons 56 years of age and over (Gordon, Mann, & Willer, 1993). Different causes result in different types of brain injury. Motor vehicle accidents generally result in

acceleration-deceleration injuries, which are usually more severe than injuries sustained in falls. However, despite the fact that older persons may generally sustain less severe injuries resulting from falls, they may be more vulnerable to the effects of trauma due to age (Rimel, Jane, & Bond, 1990).

Economic Costs. It has been estimated that the annual financial burden of TBI in the United States was approximately $37.8 billion in 1985. Within that figure $20.6 billion was attributed to injury related work loss and disability, $12.7 billion in lost income and $4.5 billion in direct expenditures for medical care and services (Max, MacKenzie, & Rice, 1991). More recent estimates suggest that the direct medical costs and indirect costs have climbed and recently totaled an estimated $56.3 billion in 1995 (Thurman, 2001). Further, beyond the direct costs, such as medical expenses, and indirect costs, such as loss of productivity, exists the toll experienced by friends and family of those individual's disabled by traumatic brain injury, or those who die prematurely. The emotional and physical consequences experienced by these individuals are substantial and not amenable to measurement (CDC, 1998).

Impact of Traumatic Brain Injury

One of the distinguishing characteristics of brain injury is the vast array of long-term deficits that can result. Disabilities and dysfunction following TBI result in a wide range of barriers to successful living and involve cognitive, emotional, and psychosocial deficits, that have a significant impact on overall outcome. Such deficits have significant implications for the injured person, families, and society.

Individual. In a mild TBI population, Paniak, Reynolds, Phillips, Toller-Lobe, Melnyk, and Nagy (2002) found that the most commonly reported symptoms one month

post-injury were fatigue, headaches, forgetfulness, sleep problems, and doing things slowly. In addition, when compared to a control group, the symptoms the TBI group reported more frequently were doing things slowly, fatigue, poor balance, difficulty thinking clearly, and dizziness.

Research findings show that 23-90% of individuals with mild traumatic brain injury (MTBI) report persistent symptoms at 1 month post-injury. When recovery is measured in terms of symptom reports, 19% of individuals with mild TBI continue to present with deficits 3 months post-injury (Graham, Adams, & Gennarelli, 1988). When examining a mixed sample of individual's with mild to moderate TBI, up to 35% of individuals present with symptoms at 1 year and 31% present with symptoms at 2 years (Kibby & Long, 1996).

Gerber and Schraa (1995) compared levels of complaints across three groups of subjects: a control group, a group of persons who had recently sustained a MTBI, and a group who had recently experienced an orthopedic injury. The authors found a small but significant percentage of subjects who volunteered somatic and cognitive symptoms at 6 months after injury. Pain and emotional distress contributed to the report of symptoms but appeared to be a general effect following trauma as opposed to specific effects of TBI. Finally, a significant percentage of MTBI subjects perceived that they had not recovered by 6 months after injury; however, there appeared to be a specific perception of vocational disability after MTBI that was primarily characterized by cognitive symptoms and was not accounted for by a more general effect of trauma. The results of Gerber and Schraa's (1995) study are consistent with other research reporting that a small but significant number of individuals with MTBI report persistent symptoms.

Cognitive. Due to the fact that they are "invisible" when compared to physical or orthopedic injuries, cognitive impairments following brain injury are often some of the more troubling deficits. Persons who have experienced a brain injury are likely to show their most debilitating cognitive deficits through failure to plan and carry out appropriate courses of action (Brooks, 1990). As a means of categorizing cognitive deficits following TBI, Prigatano (1986) classified cognitive deficits as follows: attention and concentration; initiation and goal direction; judgment and perception; learning and memory; processing speed; and communication.

Attention is usually described as a wide assortment of skills, processes, and cognitive states. Together with problems with memory, problems related to attention and concentration are the most commonly reported symptoms following traumatic brain injury (McKinlay, Brooks, & Bond, 1981). Even mild attentional symptoms tend to persist and contribute to long-term dysfunction, and are correlated with poor outcome following TBI (Brooks & McKinlay, 1987).

Reports of attention and concentration deficits are most likely to be manifested as easy distractibility, the inability to sustain focus, or the inability to shift the focus of one's attention back and forth between various tasks (Brooks, 1990; Kay & Lezak, 1990). Among the more consistent findings in individuals following TBI are decreased reaction times and reduced processing speed (Gronwall, 1991). Van Zomeren and Van Den Burg (1985) found that 84% of a sample of individuals who had sustained a severe TBI complained of cognitive deficits including slowness and poor concentration two years post injury. Similarly, Brooks et al. (1987) found that general cognitive slowness was the most frequent impairment reported by relatives of persons with head injuries in a 7-year

follow-up. Further, poor concentration and poor memory were described in three-quarters of their sample.

Complaints of memory deficits following TBI are made frequently by patients and corroborated by family members. Depending on the severity of injury, the complaints can range from trivial forgetfulness to a temporary or permanent amnesia (Brooks, 1990). These new-found memory deficits can be difficult to endure because of the contrast between recall of old, ingrained skills and material, and the impairments in registering, storing and retrieving new information (Kay & Lezak, 1990). Forgetfulness was the most common complaint in a group of patients questioned two years after head injury (Van Zomeren & Van Den Burg, 1985). Similarly, Jacobs (1988) found that learning and memory deficits significantly interfered with daily life activities including getting around independently, working, attending school, and managing household tasks such as paying bills on time.

Emotional. Kibby and Long (1996) affirm that emotional adjustment following brain injury can influence the recovery process. In addition, pre-morbid emotional distress can be significantly worsened by the transient effects of brain injury, or new emotional factors may evolve during the process of recovery that serve to complicate it. Emotional sequelae may take the form of denial, defensiveness, aggression, dependency, anger, depression, anxiety, and/or somatic concerns (O'Hara, 1988). For many individuals, TBI results in an abrupt transition from a predictable lifestyle to a state where competencies have changed and expectations for the future are uncertain. Adjusting to these sudden changes is frequently accompanied by anxiety and depression, which can amount, on occasion, to a catastrophic emotional reaction (Prigatano, 1987;

Lezak, 1987). Prigatano (1987) succinctly describes psychosocial adjustment following TBI:

> Patients who suffer brain injury with neuropsychological sequelae have a personal reaction to their deficits. Moreover, their premorbid intellectual, personality, and sociocultural characteristics interact with acquired brain injury to produce a complex symptom picture, which often involves the disorders of personality as well as cognitive functioning (p. 1).

Studies have shown that following TBI, patients frequently report higher levels of depression than before injury or compared to a control group. Dikmen and Reitan (1977) found that patients with significant deficits on neuropsychological tests showed evidence of increased depression and hypochondriasis 18 months following moderate TBI. Garske and Thomas (1992) found that based upon self-report 55% of individual's in a severe TBI population were found to be mildly to severely depressed.

According to Lezak (1978), depression is not so much a product of the injury as a reaction to the experience of loss, chronic frustration, and radical changes in lifestyle. Kibby and Long (1996) outline a typical scenario following mild TBI:

> "the emotional shock and organic factors caused by the accident contribute to the initial appearance of post-TBI symptoms. Anxiety can develop in regard to the ominous nature of these early symptoms, as they often go unexplained and undiagnosed. The fear and emotional distress connected with the post-TBI symptoms may cause them to persist when organic factors have improved. Hence long-term adjustment to these symptoms, including cognitive symptoms (e.g., memory, attention and reasoning

difficulties), is influenced in part by the emotional reaction to the injury as well as pre-and post-injury personality and psychosocial factors" (p. 177; Kibby & Long, 1996).

Rosenthal and Ricker (2000) report that the following types of impairments are often observed following TBI: Deficits in arousal, attention, memory, capacity for new learning; problems in initiating, maintaining, organizing or engaging in goal-directed behavior; self monitoring and awareness of deficits; and agitation, aggression, disinhibition and depression. The nature, severity and persistence of these deficits are highly variable between individuals and are dependent on the interaction between a variety of factors, including the nature of the brain dysfunction, premorbid psychological status (Rosenthal & Ricker, 2000), and overall emotional adjustment and coping skills (Godfrey et al., 1996).

Family. In addition to significantly affecting the individual who sustains the injury, brain injury has a deleterious impact on individual family members and family systems. Coping with the impact of head injury is one of the most difficult tasks which can confront a family. The physical, cognitive, and psychosocial sequelae of head injury have a long-term negative effect on families (Brooks, 1991; Kreutzer et al., 1992). It would not be surprising then if relatives were to find themselves overwhelmed by the dependency needs or role shift of an individual following brain injury (Kosciulek, 1996).

Oddy, Humphrey, and Uttley (1978) studied severe closed head injury patients between the ages of 16 and 39. Fourteen married subjects were interviewed together with their respective spouses. More than half the relatives 6 and 12 months after the injury reported that they were experiencing stress as a result of the injury. Similarly, McKinlay,

Brooks, and Bond (1981) asked relatives to subjectively assess the burden imposed on them by the injured relative. Personality and behavioral changes were most frequently reported as stressful, however there was no consistent relationship between the relatives' reported burden and the severity of the brain injury. Further, individuals who have sustained brain injuries, by virtue of their dependence on close relatives, impose a stress on the family system. Some families may be unable to cope, resulting in psychosocial adjustment difficulties (Livingston, 1983).

Psychosocial Adjustment to Brain Injury

While it is generally accepted that symptoms following TBI have multiple determinants, including physical, personal, social and economic factors, the relative contribution of these components to the development of persistent symptoms and their relationship to psychosocial adjustment is not well understood (Gerber & Schraa, 1995). One possible explanation for such lingering symptoms following brain injury is that they appear to be caused by a combination of organic and psychosocial factors. It is widely believed that early symptoms following TBI are related to organic factors, but that psychological factors prevent the resolution of symptoms in certain patients and in some cases bring about new symptoms (Rutherford & Merrett, 1979). Kay (1993) has suggested that an individual's functional outcome after brain injury is a product of the following: extent of damage to the brain, persistent symptoms of injury to the head, personality style of the injured person, family and social support systems, job and home requirements, age and medical factors, legal status and adequacy of medical response to the injury.

Over the past two decades, a large body of empirical literature has accumulated which has focused on adjustment and emotional outcome following traumatic brain injury (Corrigan, Bogner, Mysiw, Clinchot, & Fugate, 2001; Curran, Ponsford, & Crowe, 2000; Leblanc, Hayden, & Paulman, 2000). Researchers have documented the broad range of psychosocial symptoms and problems experienced by individuals who experience TBI. Kaplan (1988) sought to identify preinjury psychosocial variables affecting social and vocational adjustment to severe traumatic brain injury. Results showed a relationship between length of coma and length of PTA and return to work or school. Longer comas and PTAs were associated with a lower probability of return to predisability activity level. Relationships also were found between the family's reported satisfaction with their living situation, their adjustment to the subject's disability and the individual's post-trauma return to the same or slightly reduced level of work or school responsibility. No relationship was found between a client's receiving cognitive retraining services and his/her eventual return to work or school (Kaplan, 1988). Moreover, Kaplan (1990) showed that an individual's perception of their available social support is related to the intensity of their emotional distress. In sum, the process of psychosocial adjustment to brain injury is complex, multifaceted, and dynamic, and as such, requires additional study.

Life Satisfaction. Webb, Wrigley, Yoels, & Fine (1995) noted that it is "somewhat paradoxical that although quality of life is viewed as the most desirable outcome, there is no clear agreed upon definition of quality of life" (p. 1114). Fabian (1991) reviewed assessment approaches designed to measure quality of life and concluded that there are three major measurement approaches: 1) measures of life

satisfaction, 2) measures of adaptive functioning, and 3) social indicators measuring changes among groups of persons in response to programs provided.

Fuhrer (1994) asserted that any rehabilitation outcome evaluation is incomplete if the subjective well being of the individual is ignored. Dijkers (2003) distinguished between measures of subjective quality of life and cognitive versus affective orientations. The former have most often been referred to as measures of life satisfaction, whereas the latter include constructs such as happiness, morale and positive and negative affect. Corrigan, Bogner, Mysiw, Clinchot, and Fugate (2001) refer to life satisfaction as "a cognitively oriented, subjective judgment of one's current life situation in relation to one's own expectations (p. 544)."

There have been numerous studies that have examined the quality of life in survivors of traumatic brain injury. For example, Webb et al. (1995) examined quality of life outcomes among traumatic brain injury survivors. Their findings revealed that employment was the strongest contributor to quality of life. The psychosocial variables of self-blame and family support improved quality of life by reducing impairments and increasing the likelihood of employment. Similarly, Ip, Dornan, and Schentag (1995) concluded that for many of the individuals who sustain traumatic brain injury each year, employment has been found to ameliorate many of the stressors to an individual's families and society that have been associated with TBI.

Warren, Wrigley, Yoels, and Fine (1996) found that the life satisfaction of persons following TBI was associated with employment, marital status, functional memory capacity, bowel independence, family satisfaction, and perceived responsibility for the injury. Heinemann and Whiteneck (1995) found that life satisfaction was

associated with age, extent of disability, social integration, and productivity among persons with TBI living in the community. Finally, in another study, Corrigan et al. (2001) sought to identify factors associated with life satisfaction at 1 and 2 years after injury, and to identify factors that correlate with changes between the first and second years. These authors found that life satisfaction was fairly stable between the first and second year post-injury, and that changes that did occur were associated with marital status and depressed mood 2 years after injury. Further, these researchers found that current social integration and the absence of depressed mood were positively correlated at 2 years post injury.

In sum, life satisfaction following TBI is related to attaining a healthy and productive lifestyle. Similar to findings by studies of the general population, studies of persons who have sustained a TBI have shown positive life satisfaction to be related to societal participation, marital status, and employment.

Stress, Appraisal and Coping Theory

Godfrey, Knight, and Partridge (1996) proposed a Stress-Appraisal-Coping (SAC) model for conceptualizing adjustment following traumatic brain injury based upon Lazarus and Folkman's (1985) stress and coping model. These theorists hypothesized that individuals experience emotional distress when they appraise their environmental demands as exceeding their personal and socially available coping resources. TBI may invoke such conditions because neuropsychological impairment compromises the individual's pursuit of important preinjury goals and values.

Godfrey et al.'s (1996) model is designed to account for the large individual differences in emotional adjustment to seemingly similar injuries. The model includes

both general and person-specific variables. As displayed in Figure 1, the pertinent variables of the model include: stressors, coping, appraisal, social support, stress response, and adjustment.

Stressors are defined as the demands placed on individuals in their everyday lives. The authors contend that following TBI, individuals may be unable to perform social roles as competently as they could prior to their injury (Godfrey et al., 1996). The demands of their previous life roles such as work (Godfrey, Bishara, Partridge, & Knight, 1993), and family (Brooks, Campsie, Symington & Beattie, 1987; Brooks, 1991), may be perceived to now exceed their level of competence (Godfrey et al., 1996).

Coping skills have been defined as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984, p. 141). The ultimate goal of coping is to minimize the opportunity for the stressful event to cause long term negative consequences, including psychiatric, psychosomatic, and behaviorally maladaptive symptoms (Frese, 1986; Zeidner & Saklofske, 1996). Livneh and Wilson (2003) note that coping strategies have been perceived as occupying various roles within the process of adjustment. Three commonly identified roles include predictors of adjustment, mediators between predictors and outcomes, and moderators of the impact of the predictor on the outcome variable.

Godfrey et al. (1996) propose that appraisal is comprised of two processes: primary appraisal and secondary appraisal. Primary appraisal is concerned with the individual's perception of the degree of threat a situation poses. The process of appraisal is not based on an objective analysis of the information available, but rather an inference

that is determined in part by the individual's psychological characteristics. The degree of threat perceived by an individual will depend on a combination of situational, psychological, and temporal factors. Secondary appraisal is the choice of a coping response from an individual's repertoire and skills. The authors propose that coping responses are chosen which are within the individual's repertoire of skills and will overcome the problem at minimal cost.

One appraisal related concept that has generated empirical support is dispositional hope. Snyder et al. (1991, p. 571) defined hope as "a cognitive set that is based on a reciprocally derived sense of successful (a) agency (goal directed determination) and (b) pathways (planning of ways to meet goals)." Hope is said to rest upon the cognitive appraisal of one's goal related capabilities. Research suggests that individuals with higher levels of hope experience their goals in a phenomenologically more positive fashion. In particular, individuals with higher levels of hope undertake their goals with a focus on succeeding rather than failing, the perception that they will obtain their goals, and a positive emotional sate. Research suggests that these individuals view roadblocks to their goals as being a normal part of life (Snyder, 1995).

Stress responses are an individual's adverse psychological reactions to the demands placed on him or her. Examples of relevant stress responses include depression (Lezak, 1978, 1987), and distress about neuropsychological symptoms (Godfrey, Partridge, Knight, & Bishara, 1993). Godfrey et al. (1996) state that the manifestation of these signs of distress can vary in intensity, duration, and time of onset following injury.

Adjustment refers to three domains: work and social living, morale and life satisfaction, and somatic health. Work and social living reflect the cumulative effects of

the individual's appraisal and coping efforts; while morale and life satisfaction reflect an individual's satisfaction in achieving his or her expected life outcomes. Finally, somatic health is a product of neurochemical stress reactions, harmful coping, and impeding adaptive health behavior (Godfrey, et al., 1996).

Recent research has provided encouraging evidence for the applicability of the SAC model for understanding adjustment following TBI. Researchers have used Godfrey et al.'s (1996) SAC model with broad populations including students and diverse clinical samples. Researchers have found high correlations between individual's appraisal of the severity of their neuropsychological symptoms and their emotional dysfunction following TBI (Godfrey, Partridge, Knight, & Bishara, 1991; Prigatano, 1986). These findings are consistent with the model's contention that appraisal plays a determining factor in determining TBI survivors stress responses.

The potential mediating role of coping also has been supported by previous research. Moore, Stambrook, and Peters (1989) identified coping styles that closely match predictions derived from Godfrey et al.'s (1996) model. Moore et al. (1989) examined the coping behavior of TBI survivors. Using cluster analysis, these researchers found three main coping styles employed by their subjects. One group employed relatively limited coping skills and reported better psychosocial adjustment, a finding which the authors state may be indicative of individual's misappraisal or denial of difficulties. A second group made higher use of a diverse range of coping strategies and reported poorer psychosocial adjustment (e.g, higher self-reported depression symptoms). Finally, the third group made extensive use of cognitive reappraisal, and reported the most positive psychosocial adjustment of the three groups. These findings are consistent

with Godfrey et al.'s (1996) contentions that the use of cognitive mechanisms are an important component to an individual's adjustment, and that some strategies are more effective than others when coping with the psychosocial effects of TBI. In a similar study, Moore and Stambrook (1992) found that higher use of self-controlling and positive reappraisal coping strategies was associated with significantly lower mood disturbance, fewer physical difficulties and a trend to be less depressed.

Summary

The purpose of the present study was to elucidate the psychological mechanisms that impact a person's adjustment following traumatic brain injury. To accomplish this goal, the present study tested a portion of the stress, appraisal and coping model proposed by Godfrey et al. (1996) within a sample of individuals who have sustained a traumatic brain injury. The present literature review has addressed the following topics: (a) overview of traumatic brain injury, (b) impact of brain injury, (c) psychosocial adjustment to traumatic brain injury, and (d) stress, appraisal and coping theory. Traumatic brain injury is a prevalent and debilitating condition, leading to cognitive, emotional, and physical deficits. Such deficits frequently lead to diminished life satisfaction and vocational productivity. Adjustment following TBI is a complex, multifaceted process. Godfrey et al. (1996) have proposed a post-TBI adjustment model which focuses on an individual's stress, appraisal and coping to account for the individual differences in adjustment which are found following TBI. A significant advantage of conceptualizing adjustment to TBI within a Stress-Appraisal-Coping model is that the model highlights the role of factors that mediate adjustment and that may be targeted therapeutically.

Chapter III

Method

Despite the consensus among researchers regarding the complex nature of psychosocial adjustment following traumatic brain injury (TBI), the relationship between an individual's stress, appraisal, and coping processes and functional adjustment to traumatic brain injury requires further scrutiny. The process of adjustment to the effects of TBI is multifaceted and often highly individualized to the person's life circumstances. Hence, practitioners' understanding of the process of adjustment to post-TBI symptoms would be aided greatly by studies examining post-TBI adjustment in a stress, appraisal and coping context.

The present study sought to examine the psychological mechanisms that impact a person's emotional adjustment to TBI. Thus in the present study a portion of the stress, appraisal and coping model proposed by Godfrey et al. (1996) will be tested with a sample of individual's who have sustained a mild traumatic brain injury. The purpose of this chapter is to describe the variables of interest and to delineate the design used this investigation. Topics to be discussed include: (a) participants, (b) variables and measures, (c) procedure, (d) research design, and (e) data analysis.

Participants

The population of interest in the present study was individuals who have sustained a traumatic brain injury. The sampling frame was individuals who received a neuropsychological evaluation either through Psychological Associates in Rehabilitation Services (PAR) or Hope Rehabilitation Network. Study inclusion criteria were as follows: (a) the individual had sustained a mild TBI between 1997 and 2005, (b) the level

of severity of injury was verified by the staff neuropsychologist utilizing case history and objective test measures, and (c) the individual was 18 years of age at the time of the neuropsychological evaluation. The selection criteria for injury severity were based on the criteria provided by the mild traumatic brain injury committee (MTBIC) of the head injury interdisciplinary special interest group of the American Congress of Rehabilitation Medicine. The MTBIC offered the following definition of mild traumatic brain injury:

"A patient with mild traumatic brain injury is a person who has had a traumatically induced physiological disruption of brain function, as manifested by at least one of the following:

1. any period of loss of consciousness;

2. any loss of memory for events immediately before or after the accident;

3. any alteration in mental state at the time of the accident (e.g., feeling dazed, disoriented, or confused); and

4. focal neurological deficit(s) that may or may not be transient;

but where the severity of the injury does not exceed the following:

- loss of consciousness of approximately 30 minutes or less;
- after 30 minutes, an initial Glasgow Coma Scale (GCS) of 13-15; and
- posttraumatic amnesia (PTA) not greater than 24 hours. (p. 86, Mild Traumatic Brain Injury Committee, 1993)."

PAR is located in Lansing, MI. The company is a private facility that provides comprehensive rehabilitation services to outpatient clients. The facility had over 30 employees at the time of the study. The staff included healthcare professionals in addition to administrative staff, support and clerical staff, and paraprofessional staff. Traditional health care personnel included one physical therapist, two occupational therapists, one speech and language pathologist, a psychiatrist, three psychologists who specialize in neurorehabilitation, one full time psychometrist, two full-time office staff and various part-time psychometrists.

Hope Network Rehabilitation Services is a comprehensive rehabilitation company with an office location in East Lansing, MI. Over 2,100 people work in Hope Network's more than 190 different locations throughout Michigan. Since 1983, Hope Network Rehabilitation Services has provided specialized rehabilitation services to people who have sustained brain injuries and general rehabilitation services to people with other types of disabling conditions.

Participant Demographic Characteristics. Demographic data was collected both from case files and via telephone interviews. Demographic data was used for inclusion and description purposes. The variables on which data were collected include level of severity of brain injury, age, gender, time since injury, level of education, and race. Participants in the present study were 94 individuals who had sustained a documented mild TBI. Participants averaged 43.91 years of age (SD= 15.8, range= 18 to 74), with an average education level of 13.9 years (SD= 2.6, range= 8 to 22). A total of 58 (62%) of the participants were female, while 35 (37%) were male. The average time since injury was 48.8 months (SD= 50.5, range= 1 to 288). Of the 94 participants, 87 self-identified

European American, 4 African American, 1 Asian Pacific American, 1 Native American, and 1 Latina/o.

Variables and Measures

Figure 3 presents the measurement model of stress, appraisal, coping, and adjustment which was tested in the present study. The model includes the constructs of interest and their associated measures. Each of the model constructs and measures is described below.

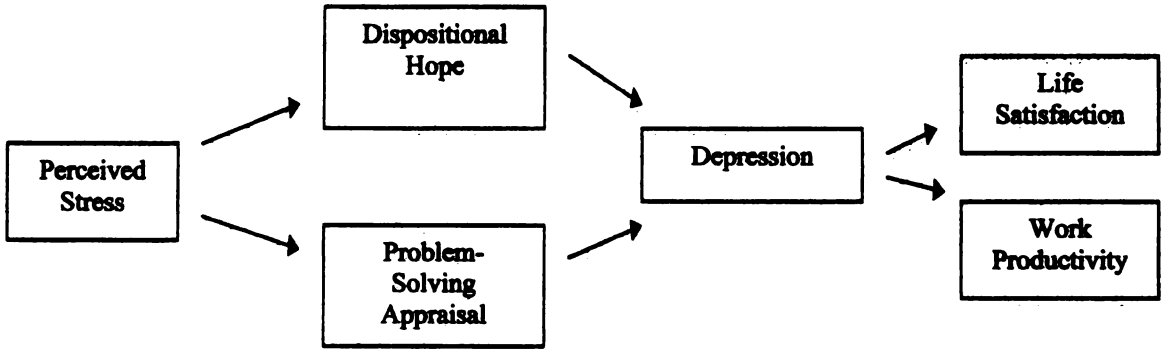


Figure 3. Measurement model of stress, appraisal, coping and adjustment to traumatic brain injury.

Stressors. In the process of psychosocial adjustment to TBI, stressors are theoretically defined as the demands placed on individuals in their everyday lives. An example of a stressor following TBI is being unable to perform social roles as competently as prior to injury (Godfrey et al., 1996). In the present study, stressors were operationally defined by scores on the Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1983). The PSS is designed to measure the degree to which situations in one's life are perceived as stressful. Items were designed to assess how unpredictable, uncontrollable, and overloaded respondents find their lives (Cohen et al., 1983; Cohen &

Williamson, 1987). Higher scores on the PSS indicate that a person perceives their life to be stressful, whereas lower scores indicate a person's appraisal of their life as relatively stress-free. Two versions of the PSS exist, an original 14-item scale and a revised 10-item scale. In the present study, the 10-item scale was utilized. Cohen & Williamson (1987) indicate that the PSS-10 allows for the assessment of perceived stress with a slight gain in psychometric quality over the PSS-14. Participants rated each of the PSS-10 items on a scale from 1 = Never to 5 = Very Often to indicate how often they experienced a feeling or thought during the last month.

Psychometric properties from the initial validation study show the 10-item PSS to be reliable for the target population based on a measure of internal consistency (alpha = .78). Further, PSS scores have been shown to correlate with other measures of appraised stress, as well as to measures of potential sources of stress as assessed by event frequency. Higher scores on the perceived stress scale have been associated with failure to quit smoking and greater vulnerability to depressive symptoms (Cohen & Williamson, 1987). The PSS can be found in Appendix F.

Appraisal. In the process of psychosocial adjustment to TBI, appraisal is conceptualized as the individual's perception of the degree of threat a situation poses (Godfrey et al., 1996). In this study, appraisal was operationally defined as the total scale score on the Hope Scale (Snyder et al., 1991). Hope is defined as the perceived capability to derive pathways to desired goals, and motivate oneself via agency thinking to use those pathways (Snyder, Rand, & Sigmon, 2002). The Hope Scale (Snyder et al., 1991) is a self-report, 12-item inventory designed to tap an individual's dispositional hope in adults, ages 15 and older. When administered, it is labeled the "Goals Scale." Subjects

are asked to respond to items on a 4-point continuum from 1 = Definitely False to 4 = Definitely True. The twelve items are based on three categories: four items reflect agency, four reflect pathways, and four items are distracters. Thus, the total Hope Scale scores a range from 8 to 32. A sample Hope Scale item is: I energetically pursue my goals.

Agency refers to the thoughts that people have regarding their ability to begin and continue movement on selected pathways toward those goals (Snyder et al., 1999). Pathways refer to a person's perceived capacity to produce cognitive routes to desired goals (Snyder, 1994). Thus, individuals engage in pathways thinking when they actively construct routes or plans for achieving goals. Agency and pathways subscales are summed to yield a total hope scale. Cronbach alphas for the total Hope Scale score ranged from .74 to .84 for six samples of undergraduate college students and two samples of individuals in psychological treatment. Test-retest correlations have been .80 or above over periods exceeding 10 weeks (Snyder et al., 1991; Lopez, Ciarlelli, Coffman, Stone, and Wyatt, 2000). The Hope Scale can be found in Appendix G.

Coping. In the process of psychosocial adjustment to TBI, coping is theoretically defined as "constantly changing cognitive and behavioral efforts to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person" (Lazarus & Folkman, 1984, p. 141). Two primary forms of coping have been proposed. The first is emotion-focused coping, which aims to regulate the person's emotional response to the stressor. The second type of coping is problem-focused coping. The goal of problem-focused coping is to manage the problem causing the distress (Godfrey et al., 1996).

In this study, coping was operationalized by total scores on the Problem-Solving Inventory (PSI; Heppner & Peterson, 1982). The PSI consists of 32 six-point Likert-type items, in which participants rate their level of agreement with statements describing their own problem-solving behaviors and attitudes. The PSI measures an individual's global self-appraisal of his or her problem-solving ability, rather than the individual's actual ability (Heppner, 1988). Factor analysis has revealed that the PSI is composed of three components: (a) Problem-Solving Confidence (self-assurance while engaged in problem solving), (b) Approach-Avoidance Style (tendency to approach or avoid different types of problem solving activities), and (c) Personal Control (control over emotions and behavior while problem solving; Heppner & Peterson, 1982; Heppner, 1988).

Total PSI scale scores are calculated by summing the responses on all 32 items. Thus, total PSI scale scores range from 32 to 192. A sample PSI item is: Many problems I face are too complex for me to solve. Lower scores on the PSI indicate assessment of oneself as a relatively effective problem solver, whereas higher scores indicate assessment of oneself as a relatively ineffective problem solver (Dixon, Heppner, & Anderson, 1991).

The PSI has generated ample research that indicates that it has sound psychometric properties and relevance to measures of key therapeutic outcomes. Studies have shown the PSI to be fairly reliable. Internal consistency measures have demonstrated alpha coefficients ranging from .72 to .90, and test-retest coefficient alphas ranging from .83 to .89 over a two-week period (Dixon, Heppner, & Anderson, 1991; Heppner, 1988).

In terms of validity, the PSI has been correlated with students' ratings of their level of problem-solving skills and their perceived level of satisfaction with skills (Heppner & Peterson, 1982). The PSI also has predicted a wide range of psychological adjustment indices in theoretically consistent manners-notably, global measures such as self-esteem, depression, anxiety, and hopelessness (Heppner & Baker, 1997; Heppner, Witty, & Dixon, 2004). Moreover, PSI scores have been found to relate to a wide range of cognitive responses, including expectations, attributions, and negative self-statements, and affective responses such as increased emotional arousal and emotionally focused self-statements when coping with difficult situations (Heppner et al., 2004; Larson, Potenza, Wennstedt, & Sailors, 1995).

Regarding the utility of the PSI with a TBI population, research shows the PSI predicts external observers' judgments of the ability of TBI patients to function independently in the community (Rath et al., 2003). Further, studies have shown the PSI to outperform standard neuropsychological problem-solving measures when differentiating adults with TBI from uninjured adults. For instance, Rath et al. (2000) compared TBI patients and uninjured controls on two standard neuropsychological problem-solving measures and the PSI. Results revealed that the two neuropsychological tests did not differentiate the two groups, but the PSI successfully differentiated the TBI patients from uninjured controls. Similar results were found by Rath et al. (2003), where the PSI differentiated TBI patients from uninjured controls, this time when education, age, and depression were controlled (Heppner et al., 2004). The Problem Solving Inventory can be found in Appendix H.

Stress Response. In the process of psychosocial adjustment to TBI, stress response is theoretically defined as an individual's adverse psychological reaction to the demands placed on him or her. Typical examples of stress responses include depression and low self-esteem (Godfrey et al., 1996). In this study, stress response was operationally defined by the total score on the Beck Depression Inventory (BDI; Beck, 1967). The BDI is a 21-item instrument designed to assess the presence and severity of depression. The majority of the items on the BDI focus on cognitions, whereas the remaining items assess affect, overt behavior, interpersonal symptoms and somatic symptoms. Each item consists of a symptom of depression, and the subject rates each item on a 4-point scale ranging from 0 to 3 on the basis of his or her present state. A subject's total score is the sum of all items, with higher scores indicating greater severity of depression. The BDI has a possible range of 0 to 63 (Beck et al., 1961). Internal consistency for the BDI ranges from .73 to .92 with a mean of .86. The BDI demonstrates high internal consistency, with alpha coefficients of .86 and .81 for psychiatric and non-psychiatric populations, respectively (Beck, Steer, & Garbin, 1988). Split half reliabilities have been reported, ranging from .78 to .93. Beck et al. (1961) did not recommend conventional test-retest reliability for the original measure. Beck suggested that if the BDI was re-administered within a short interval, the inventory would be susceptible to memory effects and if the inventory were administered after a long interval then consistency would be lower due to the intensity of depression. Despite his stance, researchers report test-retest reliabilities ranging from 48 to .86 (Groth-Marnat, 1990). The Beck Depression Inventory can be found in Appendix I.

Adjustment. In the process of psychosocial adjustment to TBI, adjustment is theoretically defined as an individual's adjustment in three domains. The first domain of adjustment is work and social living. The second domain is morale and life satisfaction. Finally, the third domain of outcome is somatic health. In the present study, adjustment will be conceptualized using the first two adjustment domains. The third domain, somatic health, will be omitted due to the focus of the study on present day functioning which conceptualizes neuropsychological symptoms and somatic health complaints as a stressor rather than a domain of adjustment (Godfrey et al., 1996).

The two domains of adjustment in the present study are conceptualized as follows. First, subjects were asked questions from the Productivity subscale of the Community Integration Questionnaire (CIQ). The CIQ consists of a total of 15 questions and the Productivity scale is comprised of 5 of the 15 items. The overall CIQ score, which represents a summation of the scores from individual questions, can range from 0 to 29. A high score indicates greater community integration, and a low score reflects less community integration. The CIQ can be further divided into three subscales. Subscales have been developed to allow an analysis of integration within specific domains of everyday life. The three subscales of the CIQ are: 1) Home integration (i.e., activities primarily related to the home; score range 1-10); 2) Social Integration (i.e., activities associated with socialization; score range 0-12); and 3) Productivity (i.e., education, vocational or other productive activities outside the home; score range 0-7; Willer, Linn, & Allen, 1993). Evidence supporting the validity of the CIQ consists of significant correlations between subscale scores and total scores with widely used outcome measures, including the Functional Independence Measure, Functional Assessment

Measure, and Disability Rating Scale (Doninger et al., 2003). Further, using classical test theory approaches, the CIQ appears to be a reasonably reliable and valid measure of psychosocial outcome after TBI (Willer, Ottenbacher, & Coad, 1994). Paniak, Phillips, Toller-Lobe, Durand, and Nagy (1999) found that only the Productivity subscale of the CIQ differentiated between a mild TBI sample and matched controls. Thus, within this study, the work productivity domain of adjustment to TBI was operationally defined as a total score on the Productivity scale of the CIQ. The Productivity scale of the CIQ can be found in Appendix K.

Next, the life satisfaction domain of adjustment to TBI was operationally defined by a total scale score on the Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). The SWLS is designed to measure the life satisfaction of an individual following brain injury. The SWLS is a five-item measure that has been shown to have sufficient psychometric properties. Subjects indicated their responses to five items using a 7-point likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), resulting in total scale scores ranging from 5 to 35. Total scores on the SWLS can be interpreted in terms of absolute as well as relative life satisfaction. A score of 20 represents the neutral point on the scale, the point at which the respondent is equally satisfied and dissatisfied (Diener et al., 1985). For example, higher scores (e.g., between 26 and 30) represent satisfied, whereas lower scores (e.g., from 5 to 9) are indicative of being extremely dissatisfied with life (Pavot & Diener, 1993).

Internal consistency of the SWLS has been shown to consistently exceed .80. For example, Pavot, and Diener (1993) found an alpha coefficient equaling .87 in a study of college undergraduates. Further, in the initial validation study, Diener et al., (1985) found

a 2-month test-retest stability coefficient of .82. Criterion related validity has also shown to be sufficient, with the SWLS correlating at an r = .50 or higher with other measures of subjective well-being (Diener et al., 1985; Pavot & Diener, 1993).

Evidence of construct validity of the SWLS can be found in a number of different studies. The SWLS has been administered in conjunction with measures of positive and negative affective appraisal (Pavot, Diener, Colvin, & Sandvik, 1991). The SWLS correlates with scales measuring both constructs even though the two are unrelated. The absolute values of such correlations range from .26 to .47, indicating that the SWLS measures a dimension of subjective well-being different from either positive or negative affectivity. Similarly, SWLS scores have been found to be positively correlated with extroversion and inversely correlated with neuroticism (Diener et al., 1985; Pavot & Diener, 1993; Pavot, Diener, Colvin, & Sandvik, 1991).

The SWLS has been used in several studies examining the impact of TBI on an individual's functioning. Relevant studies have found higher levels of satisfaction with life have been associated with employment, less depression, the absence of a prior history of substance abuse, greater social integration, and lower Glasgow Coma Scale scores at emergency room admission (Corrigan, Smith-Knapp, & Granger, 1998). Further, Sokol et al., (1999) found that higher life satisfaction was related to lower levels of unmet needs, having a spouse or partner, the perception that the TBI had minimal impact on one's life, having higher levels of education, and better emotional status since TBI. The Satisfaction With Life Scale can be found in Appendix J.

Procedure

Prior to the initiation of this study, approval was obtained from the University Committee for Research Involving Human Subjects at Michigan State University (UCRIHS). Once approval was obtained, PAR Rehabilitation Services was contacted to obtain a sample. Administrators at PAR were explained the premise of the study and their approval was obtained prior to contacting potential participants.

Participants were initially identified by reviewing a comprehensive list of past consumers. These potential participants were mailed an informed consent form and HIPAA release of information form. Individuals were informed of their rights as participants and instructed that if they agreed to participate, their evaluation results would be used and they would be asked to take part in a structured telephone interview that would take approximately twenty minutes. Within the informed consent form, participants were told that if they wished to not participate, they did not need to return the enclosed forms. An additional reminder was mailed to potential participants two weeks after the initial letter. An initial mailing was sent to 315 potential participants. Of the 315 potential participants, 60 individuals returned the informed consent and HIPAA forms and completed the phone interview, resulting in a 19% response rate.

In order to minimize the time requirement on potential participants, telephone interviews initially served as the primary data collection technique. On average, interviews took approximately 20 minutes (range 15-55 minutes). In an effort to increase sample size, study methodology was expanded to prospectively enroll participants at PAR. This procedure resulted in an additional 30 study participants.

To further increase the number of study participants, Hope Rehabilitation Network (Hope) was then added as a second data collection site. First, the clinical director at Hope generated a list of potential participants. Next, both the licensed psychologist from PAR and the clinical director from Hope reviewed a potential subject list and determined which individuals would meet the inclusion criteria for the present study. Once individuals were determined to meet inclusion criteria they were mailed a description of the study which offered a $10 cash incentive for completion of the study, an informed consent form and HIPAA release of information form. Once consent was obtained, individuals were mailed a copy of the study materials. Following completion of the study materials, participants were mailed a brief thank-you and a $10 cash payment. Through this final enrollment method, four participants were enrolled. These combined procedures resulted in a total of 94 individuals who participated in the present study.

Research Design. In order to elucidate the psychological mechanisms that impact a person's emotional adjustment following mild traumatic brain injury, an ex post facto research design was required to test the research hypothesis. Ex post facto research is systematic inquiry in which the researcher does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable (Kerlinger, 1973). Ex post facto studies attempt to establish relationships among variables. Inferences about relationships among variables are made, without direct intervention, from concomitant variation of predictor and criterion variables. Sustaining a mild TBI is inherently not manipulable. Therefore, controlling the resultant adjustment is not possible. Therefore, an ex post facto research design is

most appropriate for the purpose of this study: to elucidate the psychological mechanisms that impact a person's long-term adjustment following mild traumatic brain injury.

Data Analysis. Structural equation modeling is a statistical methodology that takes a hypothesis-testing approach to the multivariate analysis of a structural theory bearing on some phenomenon (Byrne, 2001). SEM is the only analysis that allows complete and simultaneous tests of relationships in multidimensional data (Ullman, 1996). SEM is appropriate whenever models of relations among variables need to be estimated and tested (Baldwin, 1989). Furthermore, given that SEM is a method for testing a specified theory about relations between constructs (Tabachnick & Fidell, 1996), it was identified as the most appropriate statistical technique for testing the hypothesized SAC structural model.

While SEM was identified as the most appropriate analysis for the present study, Hair, Anderson, Tatham, and Black (1998) note that SEM is a statistical methodology which encompasses an entire family of models. Out this group of techniques, path analysis was chosen as the most appropriate data analysis technique to test the hypothesized model. Path analysis is appropriate because the data in the present study does not utilize latent constructs. Further, path analysis allows a researcher to test a theory of causal order among a set of variables (Klem, 1995). Path analysis is an extension of the regression model. That is, within a hypothesized model, a regression weight is calculated for each variable in the model as dependent on other variables that the model indicates are causes. The regression weights predicted by the model are compared with the observed correlation matrix for the variables, and a goodness-of-fit statistic is calculated (Hair et al., 1998).

Within path analysis, there are two major kinds of results. First, path analysis provides estimates of the magnitude of the hypothesized effects. However, Klem (1995) cautions that it is important to recognize that the estimates obtained are conditional on the model being correct. That is, they are estimates of the size of the effects, under the assumption that the model is correct. The resultant estimates are termed path coefficients. A path coefficient is a standardized regression coefficient showing the direct effect of an independent variable on a dependent variable in the path model controlling for other prior variables (Klem, 1995). Second, a path analysis allows researchers to test that the model is consistent with the observed data. If the model is not consistent with the observed data, one can reject the model as being very unlikely (Klem, 1995).

Chapter IV

Results

The purpose of the present study was to explicate the psychological mechanisms that impact a person's adjustment to TBI by testing a portion of the stress, appraisal and coping (SAC) model proposed by Godfrey et al. (1996) with a sample of individual's who have sustained a mild traumatic brain injury. A significant advantage of conceptualizing adjustment to TBI within a SAC model is that the model highlights the role of factors that mediate adjustment and may be targeted therapeutically. The purpose of this chapter is to describe the findings from the present study.

Figure 3 illustrates the hypothesized stress-appraisal-coping measurement model that was tested in this study. Two types of data analysis software were used to confirm and measure relationships between variables in the model: (1) descriptive statistics and correlations among variables were calculated using the statistical package for the social sciences (SPSS; 2001), and (2) path analysis was conducted using AMOS 4.0 (Arbuckle & Wothke, 1999). Missing data was accounted for using the statistical procedure of mean imputation. No participant had a large number of items missing from any one survey scale.

Descriptive and Correlation Results

Means, standard deviations, ranges, and internal consistencies (Cronbach alphas) regarding study variables are presented in Table 1. A correlation matrix of all study variables is presented in Table 2. The mean depression score (M = 16.7, SD = 10.8) indicates that the present sample endorsed a mild to moderate level of depressive

symptomology (Groth-Marnat, 1990). Further, the mean problem solving appraisal score (M = 100.7, SD = 17.0) is indicative of a negative appraisal of one's problem solving abilities. Both of these means are similar to previous studies examining depression and problem solving appraisal following traumatic brain injury (Curran, Ponsford, & Crowe, 2000; Rath et al., 2003; Rath et al., 2004). The internal consistency measures for the scales in the present study ranged from .48 to .93. Nunnelly (1978) suggests that alpha should be at least .70 or higher to retain an item in an "adequate" scale; and many researchers require a cut-off of .80 for a "good scale." Using Nunnelly's (1978) standards, of the six internal consistency reliability estimates reported, four would be considered "good" (i.e., the Satisfaction With Life Scale, the Beck Depression Inventory, Hope Scale, and the Perceived Stress Scale), one, the Problem-Solving Inventory (α = .73), fell in the adequate range, and the work productivity subscale of the CIQ (α = .48) was outside of the "adequate" range.

The correlations between study variables were generally low to moderate with approximately half reaching statistical significance, and thirteen of the seventeen significant correlations were significant at the $p < .01$ level. Further, the correlations between variables within the model were in the predicted direction and consistent with previous research utilizing the measures. The strongest correlations were found between depression and hope ($r = -.74$, $p < .01$), depression and perceived stress ($r = .67$, $p < .01$), and depression and life satisfaction ($r = -.67$, $p < .01$). Thus, in the present study, an increase in depression was associated with higher levels of perceived stress, lower levels of life satisfaction, and lower levels of dispositional hope.

Table 1

Stress, Appraisal, Coping and Adjustment Variable Descriptive Statistics

Variables	M	SD	Range[a]	α
1. Age	43.9	15.8	18-74	–
2. Education Level	13.9	2.6	8-22	–
3. Time Since Injury	48.8	50.5	1-288	–
4. CIQ	3.8	2.3	0-5	.48
5. SWLS	21.0	8.0	5-35	.88
6. BDI-2	16.7	10.8	0-63	.93
7. PSI	100.7	17.0	32-192	.78
8. Hope	23.4	4.9	8-32	.89
9. PSS	28.8	9.3	10-50	.83

Note. CIQ- Community Integration Questionnaire- Productivity Subscale; SWLS- Satisfaction with life scale, BDI- Beck Depression Inventory-2nd Edition, PSI- Problem-Solving Inventory Total Score, Hope- Hope Scale Total Score, and PSS- Perceived Stress Scale- Total Score.

[a] Minimum to maximum.

Path Analysis Results

Path analysis was used to address the hypothesized relationship between perceived stress, dispositional hope, problem solving appraisal, depression, satisfaction with life, and work productivity. To assess the fit of the hypothesized structural model,

Table 2

Correlations Among Stress, Appraisal, Coping and Adjustment Variables

Variables	1	2	3	4	5	6	7	8	9
1. Age	–								
2. Education Level	.15	–							
3. Time Since Injury	.11	.23*	–						
4. CIQ	-.31**	.26*	.12	–					
5. SWLS	.00	.29**	.15	.39**	–				
6. BDI-2	.07	-.20	-.08	-.42**	-.67**	–			
7. PSI	-.03	-.18	-.13	.05	-.31**	.11	–		
8. Hope	-.10	.36**	.17	.45**	.65**	-.74**	-.21*	–	
9. PSS	-.13	-.16	-.13	-.25*	-.58**	.67**	.19	-.60**	–

Note. CIQ- Community Integration Questionnaire- Productivity Subscale; SWLS- Satisfaction with life scale, BDI- Beck Depression Inventory-2nd Edition, PSI- Problem-Solving Inventory Total Score, Hope- Hope Scale Total Score, and PSS- Perceived Stress Scale- Total Score. *$p < .05$, **$p < .01$.

four generally accepted measures of fit were examined (see Kline, 1998): the chi-square (χ^2) statistic, the Bentler-Bonett Normed Fit Index (NFI) statistic, the Tucker-Lewis index (TLI) and the root mean square error of approximation (RMSEA).

The chi-square statistic tests the null hypothesis that the model and the data do not differ, with lower values indicating a better fit. Typically, a nonsignificant chi-square is sought, which indicates no significant difference between a hypothesized model and observed data. To interpret the chi-square, Kline (1998) suggested dividing the chi-square statistic by the degrees of freedom in the model. Models with ratios less than three are considered a good fit.

The NFI indicates the proportion in the improvement of the overall fit of the researcher's model relative to a null model. The typical null model is an independence model, that is, one in which the observed variables are assumed to be uncorrelated (Kline, 1998). Kline (1998) provides the following illustration, "If the NFI equals .80, for example, then the relative overall fit of the researcher's model is 80% better than that of the null model estimated with the same sample data" (p. 129). Similarly, the TLI assesses the proportion of the variance and covariance accounted for by the model but relative to the null model. The NFI and TLI vary along a 0-to-1 continuum, and values greater than .90 are generally thought to reflect a good fit to the data (Kline, 1998).

The RMSEA is the average difference between sample variances and covariances and the estimated population variances and covariances. The RMSEA has a range of 0 to 1. RMSEA values less than .05 suggest a close fit (Tabachnick & Fidell, 1996).

Based on Godfrey et al's (1996) stress, appraisal, and coping model, it was hypothesized that the theoretical model shown in Figure 2 would fit the sample data. The

present path analysis results indicate that the research hypothesis did not receive support. As indicated in Table 3, the results indicate a poor fit between the hypothesized theoretical model shown in Figure 2 and the sample data.

Table 3

Structural Equation Fit Indices

Model	χ^2	df	χ^2/df	NFI	TLI	RMSEA
Hypothesized model	72.13	20	3.6	.73	.69	.17
Final structural model	8.23	4	2.1	.96	.95	.11

Note: NFI = Normed Fit Index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation.

Test of the revised structural model. Byrne (2001) stated that one advantage of using path analysis is that models specified a priori can be modified according to theory, previous research, and fit information provided by statistical output, to develop models that better fit the data. Based upon the resultant modification indexes (MI), modifications were undertaken that improved overall model fit. Three modifications were made to the hypothesized stress-appraisal-coping structural model. First, direct path coefficients which were not statistically significant were removed. This resulted in removing the problem-solving appraisal variable from the model. Second, as recommended by Byrne (2001), modification indexes were reviewed to identify paths that were not originally specified that might improve overall model fit. MI is also termed the Lagrange Multiplier (LM) test or index because MI is a univariate form of LM. MI is often used to alter models to achieve better fit. Through the use of MI, improvement in fit is measured by a reduction in chi-square (Tabachnick & Fidell, 1996).

Based on output from MI statistics, several changes were made to the model. First, MI suggested that if a direct path were specified from dispositional hope to life satisfaction and from dispositional hope to work productivity, dispositional hope would have a significant impact on both outcome measures. Further, the addition of these path coefficients would result in a model that better fits the data. Therefore, these paths were added to the model.

The second change suggested by MI data was specifying a path from depression to dispositional hope. The MI suggested that depression would have a significant impact on dispositional hope. Thus, this path was specified. Implementing both of these paths changed the ordering between dispositional hope and depression.

Beyond the support garnered from the MI, these two changes to the final structural model are supported by previous research. Depression occurs with sufficient frequency to be considered a common and significant consequence following TBI (Rosenthal, Christensen, & Ross, 1998). Studies have shown that following TBI, loss or decrease in pre-injury social contacts, decrease in leisure activities, and decrease in level of independence all substantially contribute to self reported depression following TBI (McNeny, 1990; Morton & Wehman, 1995; Rosenthal, Christensen, & Ross, 1998). Moreover, other studies have demonstrated that a higher number of mild TBI survivors report depressive symptoms compared to survivors of severe TBI, and that patients examined more than 6 months after injury reported higher levels of depression than did patients in the acute stages of recovery (Rosenthal, Christensen, & Ross, 1998). Consistent with these findings, researchers have indicated that people with mild brain injuries are often keenly aware of their problems, and that persons with severe injuries

are less likely to be aware problems (Seel et al., 2003; Prigatano, 1991). Therefore, based upon prior research and the present MI data, the order in which depression and dispositional hope appear within the final model is altered. As such, depression is shown to be predictive of lower levels of dispositional hope, while dispositional hope positively predicts both life satisfaction and work productivity.

Finally, the MI data reveals that there is a potential for correlated error between the error terms for depression and life satisfaction and the error terms for dispositional hope and life satisfaction. Correlated error terms refer to situations in which knowing the residual of one indicator helps in knowing the residual associated with another indicator. For instance, a commonly cited example in survey research is that many people tend to give the response that is socially acceptable. Knowing that a respondent gave the socially acceptable response to one item increases the probability that a socially acceptable response will be given to another item. Such an example exhibits correlated error terms (Garson, 2006).

The MI data suggest that participants may have demonstrated a response bias (e.g., consistent endorsement of the same response choice) toward items on the Satisfaction With Life Scale and the Dispositional Hope scale. Such a response pattern would yield the potential for correlated error terms. However, error terms are correlated only when the reasonableness of the possible paths is supported by theory and/or previous research. Therefore, the rationale for both paths in the final model was evaluated in the context of prior research. The positive correlation between the error terms for life satisfaction and depression suggests that participants responded consistently to content that was deemed outside the realm of their control (e.g., TBI-related symptoms

of depression), or dependent on pre-injury factors beyond their control (e.g., the contributions of others to overall quality of life). This finding makes intuitive sense and is consistent with previous research which suggests that "following the TBI, clients may perceive events as less within their control, thus making them less likely to internalize blame and endorse items relating to a sense of failure, guilt and self-accusation" (Green et al., 2001).

Conversely, examining the content of the SWLS and Hope Scale suggests that participants may have displayed a negative bias toward Hope Scale items that require an assessment of their own abilities to attain a goal (e.g., "I can think of many ways to get the things in life that are most important to me."). This finding is consistent with TBI literature which suggests that after TBI individuals are likely to show their most debilitating cognitive deficits through failure to plan and carry out appropriate courses of action (Brooks, 1990) and problems in initiating or maintaining goal-directed behavior (Rosenthal & Ricker, 2000). The addition of the two correlated error paths are supported by previous research documenting common psychosocial deficits following TBI and are consistent with the findings that individuals with mild TBI tend to be keenly aware of such deficits (Seel et al., 2003). Therefore, based on prior research and the present MI data, the error terms for depression, dispositional hope, and life satisfaction are correlated in the final model. Including the two correlated error paths in the final model increased the overall fit of the model to the data.

Figure 4 depicts the final model. The general flow of the model contains four primary functional relationships: (1) the relationship between perceived stress and depression, (2) the relationship between depression and hope, (3) the relationship

between hope and satisfaction with life, and (4) the relationship between hope and productivity. The final model has two important features worth noting. First, it contains predictive relationships among latent variables which are represented by single-headed arrows. Second, it contains correlational or bi-directional relationships among several of the residuals represented by the dual-headed arrows connecting eD with eS and eH with eS, respectively. As illustrated in Figure 4, all standardized regression weights in the re-specified model were statistically significant at the $p < .001$ level.

Further, as shown in Table 3, the test of this revised structural model resulted in adequate fit indices. Both the TFI and TLI were found to be adequate in comparison to the .90 value suggested by Kline (1998). Additional support for the model is provided by the chi-square statistic ($\chi^2 = 8.42$, ns), which resulted in retaining the null hypothesis that the data is a sound representation of and does not differ from the model. However, the RMSEA, while demonstrating improvement compared to the initial model, still was above the .05 level indicative of a close fit with the data (Kline, 1998). Thus, relying on statistical, theoretical, and clinical research rationales, the final structural model depicted in Figure 4, as determined through standard post hoc model-fitting procedures, stands as an adequate representation of the sample data.

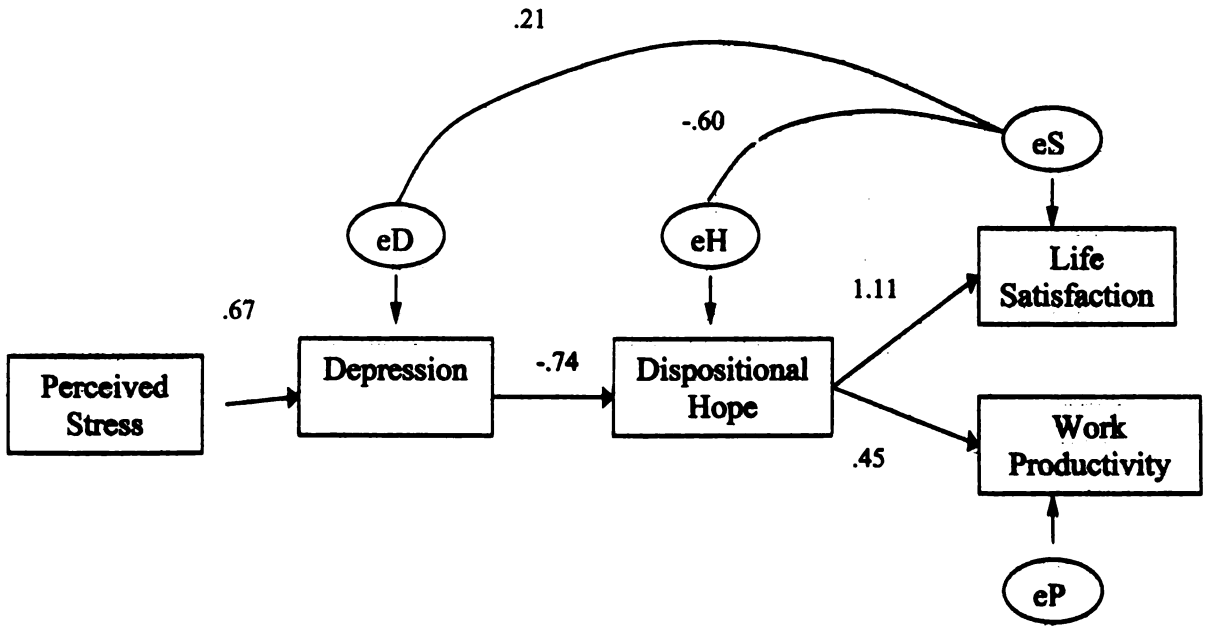


Figure 4. Final stress-appraisal-coping structural model.

Standardized total effects from the re-specified model are shown in Table 4. For standardized effects, the numerical value is the number of standard deviation units in the dependent variable corresponding to a one-unit change in the independent variable. Total effects may also be decomposed into spurious and total causal effects, and the total causal effect can be decomposed into a direct and an indirect effect. Total effects are the sum of all direct and indirect effects of one variable on another. Total standardized effects are interpreted as path coefficients (Kline, 2005). For instance, the value of -.223 in Table 4 which shows the relationship between perceived stress and work productivity means that increasing perceived stress by one standard deviation reduces work productivity by this amount via all presumed direct and indirect predictive links between these variables (Arbuckle & Wothke, 1999).

Table 4

Standardized Total Effects

	Perceived Stress	Depression	Hope
Depression	.674	.000	.000
Hope	-.495	-.735	.000
Work Productivity	-.223	-.331	.450
Life Satisfaction	-.547	-.812	1.105

Standardized direct effects from the re-specified model are shown in Table 5. The direct effect is the partial coefficient for y on x controlling for all prior variables and all intervening variables in the model. The standardized direct effects in Table 5 are interpreted as path coefficients. The standardized (unmediated) direct effect of Depression on Hope is -.735. That is, due to the direct (unmediated) effect of Depression on Hope, when Depression goes up by one standard deviation, Hope goes down by .735 standard deviations. This is in addition to any indirect (mediated) effects that Depression has on Hope (Arbuckle & Wothke, 1999).

Table 5

Standardized Direct Effects

	Perceived Stress	Depression	Hope
Depression	.674	.000	.000
Hope	.000	-.735	.000
Work Productivity	.000	.000	.450
Life Satisfaction	.000	.000	1.105

Standardized indirect effects from the re-specified model are shown in Table 6. The indirect effect is the total causal effect minus the direct effect, and measures the effect of the intervening variables. Indirect effects are the sum of all indirect effects of a causally prior variable on a subsequent one. Indirect effects are estimated statistically as the product of direct effects that compromise them. They are interpreted as path

coefficients (Kline, 2005). The standardized indirect effect of depression on life satisfaction is -.812. That is, due to the indirect mediated effect of depression on life satisfaction, when depression goes up by one standard deviation, life satisfaction goes down by .812 standard deviations. This is in addition to any direct (unmediated) effect that depression has on life satisfaction (Arbuckle & Wothke, 1999).

Table 6

Standardized Indirect Effects

	Perceived Stress	Depression	Hope
Depression	.000	.000	.000
Hope	-.495	.000	.000
Work Productivity	-.223	-.331	.000
Life Satisfaction	-.547	-.812	.000

Conclusion

The final SAC path model depicted in Figure 4 meets criteria for evaluating model fit when using SEM. First, it can be explained by stress, appraisal, coping, and TBI research. Second, model adequacy is indicated by collective statistical criteria (i.e., adequate NFI and TLI fit index, and non-significant χ^2). Finally, the model is parsimonious, or simple. In accordance with model evaluation guidelines described by researchers (e.g., Arbuckle & Wothke, 1999; Kline, 2005) model parsimony is indicated by the model's relatively small number of parameters.

Chapter V

Discussion

The present study sought to elucidate the psychological mechanisms that influence an individual's adjustment to TBI by testing a portion of the Stress-Appraisal-Coping model proposed by Godfrey et al. (1996) with a sample of individuals who have sustained a mild traumatic brain injury. Researchers have suggested that a significant advantage of examining adjustment to TBI within a Stress-Appraisal-Coping model is that such a model emphasizes the role of factors that mediate adjustment and may be targets for therapeutic intervention. The potential value of the present study is to aid in the development of coping skills-based rehabilitation programs. This Discussion chapter addresses the following topics: (a) limitations of the study, (b) narrative summary of results, (c) relation of findings to previous research, (d) clinical implications of the findings, and (e) suggestions for future research.

Limitations of the Study

There are several limitations of the current study that must be noted. The first relates to sample size. There is discussion in the literature regarding what sample size is adequate for structural equation modeling. Byrne (1994) stated that samples of at least 200 are necessary to obtain stable and replicable SEM results. Other writers base the necessary sample size for the use of SEM on the number of variables within the model. For example, Kline (2005) suggested that a desirable ratio between participants to variables is 20 to 1. Due to the sample size of 94 obtained in this study, it is possible that results may be unstable and lack replicability. Thus, future studies focused on evaluating

stress, appraisal, and coping following TBI using models such as Godfrey et al.'s (1996) should seek to include larger samples.

A second limitation that must be noted is that the homogenous nature of the clinical setting used in this study limits the generalizability of results. Individuals with TBI who receive services at PAR will differ from individuals with TBI who receive services in other clinical settings. Thus, to further examine the utility of Godfrey et al's (1996) SAC model, additional studies must address the role of stress, stress response, and appraisal in adjustment to TBI in a variety of clinical contexts.

In addition to the specific clinical context of the study, participant demographic characteristics in the present study are unique compared to the general population of persons with TBI. More specifically, 62% of the participants were female, while in the general population of people with TBI males have significantly higher rates of TBI than females, with males experiencing 140 per 100,000 population and females 66 per 100,000 (Centers for Disease Control and Prevention, 1997). Therefore research samples primarily comprised of female participants offer distinct contributions to research examining emotional adjustment following TBI. Further, within the present sample, 93% of participants self-identified as Caucasian, and possessed an average education level of 13.9 years. Summaries of the demographic characteristics of persons with brain injuries indicate that many individuals with TBI represent ethnic minority groups and are persons with low levels of education (Gordon et al., 1993). As such, researchers should use caution when generalizing the present findings to males with TBI and individuals with TBI from different ethnic and educational backgrounds.

An additional limitation relates to the fact that the quality of the data in this study may have been influenced by data collection procedures. Data were collected using both telephone interviews and paper and pencil surveys completed independently by participants. Given the nature of cognitive deficits following TBI, the lack of a one-to-one, in-person clinical interview protocol may have influenced the reliability and validity of the data.

Next, in relation to research design, due to the descriptive and correlational nature of this study, no definitive causal attributions can be made regarding the relationships between study variables. In the future, researchers should use other methods of inquiry, including qualitative, experimental and longitudinal studies, to evaluate the theoretical and practical value of Godfrey et al.'s (1996) SAC model.

Finally, it is possible that non-normal distributions for several study variables contributed to the results. For example, standardized effects are transformed so that their mean is 0 and standard deviation is 1.0. As such, the standardized total effect for Hope predicting Life Satisfaction (1.105) falls outside the –1 to +1 range commonly seen with standardized effects. Potential factors that would contribute to a standardized effect size greater than +/- 1 include multicollinearity, non-normally distributed variables, and underestimated standard deviation. In the present study, the distribution of several model variables may have contributed to the effect size greater than one.

Narrative Summary of Results

Based on Godfrey et al's (1996) stress, appraisal, and coping model, it was hypothesized that the structural model shown in Figure 2 would fit the sample data. The initial analysis indicated that the study hypothesis was not supported. That is, the

hypothesized model shown in Figure 2 did not fit the sample data. Therefore based upon relevant statistical output, previous research and theory, several modifications were made to the hypothesized model.

First, problem-solving appraisal did not significantly contribute to the necessary fit indices, and was removed from the final model. Next, the order in which depression and dispositional hope appear within the final model was reversed. Both modification index (MI) data and previous research examining depression following TBI (McNeny, 1990; Morton & Wehman, 1995; Rosenthal, Christensen, & Ross, 1998; Seel et al., 2003) support the re-specification. The re-specified order of these two variables resulted in an improved fit between the model and sample data. The re-specified order suggests that higher levels of depression negatively predict or impact a person's dispositional hope (i.e., perception of their ability to generate and move toward selected goals through cognitively generated routes; Snyder et al., 1991). Further, creating direct paths between hope and adjustment indicates that dispositional hope positively predicts both life satisfaction and work productivity.

Finally, the results indicated that participants in the present study demonstrated a response bias to depression, dispositional hope, and life satisfaction survey items. That is, participants responded to items that focused on content perceived to be outside of their control, or dependent on pre-injury factors beyond their control in a similar and consistent manner. Conversely, participants displayed a negative bias toward items that required an assessment of their own abilities to attain a goal. Accounting for this response bias in the final model through correlated error terms was supported by both

statistical output and previous research (Prigatano, 1986; Brooks, 1990; Green et al., 2001), and resulted in an improved fit between the sample data and final model.

While the interpretation of the correlated error terms is logical and supported by both the MI data and previous research, the potential for alternate explanations exist. First, participants may have enacted an alternate response bias (e.g., consistently endorsing the same response choice). Further, the data suggest the possibility of an unmeasured variable impacting the final model. For instance, the final model places an importance upon an individual's cognitive worldview. As such, a concept such as locus of control or attributional style may in part account for the correlated error terms found in the final model.

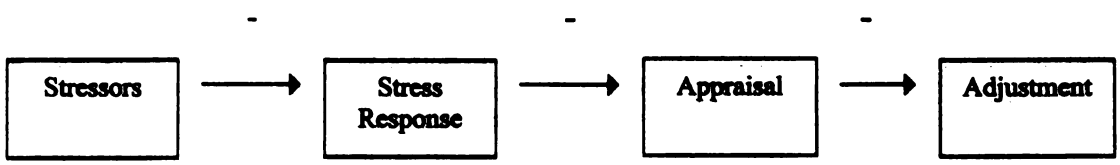


Figure 5. Final Structural Model Utilizing Godfrey et al.'s (1996) SAC Theory Terminology.

In summary, the final SAC path model depicted in Figure 4 meets criteria for evaluating model fit when using SEM. First, the model can be explained by stress, appraisal, and coping research as well as TBI research. Second, model adequacy is indicated by collective SEM statistical criteria (Kline, 2005). The following commonly utilized SEM statistics were used to evaluate the relative model to data fit: the chi-square (χ^2) statistic, the Bentler-Bonett Normed Fit Index (NFI) statistic, the Tucker-Lewis index (TLI) and the root mean square error of approximation (RMSEA). Figure 5 depicts the

final model in the context of the initial theoretical framework. In sum, statistical output data indicate an adequate fit between the model shown in Figure 4 and the sample data.

Relation of Findings to Previous Research

The final model suggests that higher levels of perceived stress were predictive of increased report of depressive symptomatology. This finding is consistent with TBI literature examining depression following TBI. Researchers have suggested that TBI leads to a period of change where an individual's competencies have changed and expectations for the future are uncertain. Adjusting to these sudden changes is frequently accompanied by anxiety and depression (Lezak, 1987; Prigatano, 1987). The rates of depression following TBI range from 26% to 77%, and when the severity of the injury is mild research has shown that survivors are more acutely aware of incurred deficits, and report higher levels of depression as compared to individuals with more severe brain injuries (Prigatano, 1991; Seel et al., 2003).

Similarly, the final model demonstrated that higher levels of depression were predictive of lower levels of dispositional hope. This finding is consistent with literature on hope and depression, where a strong correlation has been found between levels of hope, self-worth, and depression (Snyder, Rand, & Sigmon, 2002). However, the predictive order in which depression and hope appear in the final model contrasts with the hypothesized order in Godfrey et al.'s (1996) model. This finding may be the result of several factors. For instance, the order in which depression appears in the final model may be due to the aforementioned finding that rates of depression and awareness of deficits have been shown to be higher following mild TBI. Further, the awareness of deficits may have been more pronounced due to the presence of affective and

performance related items on the BDI-II (Green et al., 2001). Consequently, future research is warranted to specify the relative order of the variables in Godfrey et al.'s (1996) model.

Findings also indicated that a higher level of dispositional hope was predictive of increased life satisfaction and work productivity. Similarly, depression was indirectly predictive of life satisfaction. These findings are consistent with prior research which has shown higher levels of life satisfaction to be associated with employment, less depression, greater social integration (Corrigan, Smith-Knapp, & Granger, 1998), lower levels of unmet needs, the perception that the TBI had minimal impact on one's life, and better emotional status since TBI (Sokol et al., 1999).

A finding in the present study that conflicts with previous research is that problem-solving appraisal did not contribute to emotional adjustment following mild TBI. Previous research has shown the importance of problem-solving abilities in post-TBI adjustment (von Cramon & Matthes-von Cramon, 1991; Cicerone et al., 2000). Further, problem-solving appraisal has been shown to predict a wide range of psychological adjustment indices (Heppner & Baker, 1997; Heppner, Witty, & Dixon, 2004). In addition, problem-solving appraisal also has been shown to predict external judgments of TBI patients' ability to function independently in the community and also differentiate adults with TBI from uninjured adults (Rath et al., 2003). The present finding may be attributable to initiation and goal-direction deficits which occur following TBI, which were measured in this study by Hope Scale items tapping agentic thinking (Snyder, Rand, & Sigmon, 2002).

In sum, the findings in this study are consistent with Godfrey et al's (1996) suggestion that cognitive moderators and coping strategies can be powerful determinants of recovery. The current data suggest that cognitive moderators, such as dispositional hope, play an important role in life satisfaction and work productivity, two common indicators of successful post-TBI adjustment. Future research examining the role of hope and depression in post-TBI adjustment should delineate the role of perceived control over depressive symptoms, hope-related cognition, and life satisfaction.

Clinical Implications of the Findings

The present study holds several implications for clinical practice. First, it contributes to the literature on emotional adjustment following mild TBI. It also provides data on how psychological variables in persons with TBI are related to each other. More specifically, results in this study suggest that the variables of perceived stress, depression, and dispositional hope are related to post-TBI adjustment (i.e., life satisfaction and work productivity) in a direct and straightforward manner.

If a series of studies detect results consistent with those in the current study across different samples and clinical settings, such data may indicate specific targets for intervention. For example, results suggest that clinicians should assess an individual's level of perceived stress as a starting point for evaluating treatment needs. Elevated levels of perceived stress could provide clinicians a focal point that can be addressed therapeutically via cognitively-based, appraisal-related therapies.

Given the significant role of a person's perceived stress level and personal assessment of their own goal-directed behaviors in the final model therapies addressing an individual's cognitive worldview may be warranted. An example of such a therapy is

Rational Emotive Therapy (RET) (Ellis & Grieger, 1977). RET is a cognitive-behavioral based therapy that seeks to identify catastrophic thinking and change the irrational assumptions that underlie it. Due to the sometimes inaccurate and unrealistic perceptions of self and others among persons with TBI (Prigatano, 1987), RET may be useful for assisting individuals with mild TBI by helping them develop a more rational view of themselves, others, and the world around them.

The final model in this study also suggests that it may be beneficial for clinicians to integrate positive psychology based interventions into mild TBI rehabilitation. More specifically, findings suggest that targeting dispositional hope via therapeutic intervention is important because it positively influences both life satisfaction and work productivity. Snyder (1994) argued that cognitive based intervention strategies facilitate the increase an individual's level of hope. Hope theory predicts, in light of the client's perceived goal blockage, that an optimal intervention will need to include the therapist's framing of the presenting problem(s) as a clearly defined set of goals which are explicitly linked by the therapist to credible strategies (pathways) for their attainment (Snyder, 1994). To develop and maintain a growing sense of hopefulness early in therapy, clients need a credible description of how the treatment is going to help. In order to enhance hope, clients should be presented with a logical justification that outlines a credible set of pathways for reaching the goal of symptomatic improvement (Snyder, 1994).

Finally, the findings in this study further underscore the importance of assessing and treating depression following TBI. Unfortunately, previous research has indicated that depression is common following TBI (McNeny, 1990; Morton & Wehman, 1995; Rosenthal, Christensen, & Ross, 1998). Results in the current study contribute to this

literature by demonstrating the potential influence of depression on dispositional hope, life satisfaction and work productivity post-TBI. As such, the assessment and treatment of depression should be an integral part of any mild TBI rehabilitation program.

Suggestions for Future Research

The results found in this study suggest several avenues for future research regarding post-TBI emotional adjustment. First, future studies should seek to test the Godfrey et al. (1996) model with larger samples. The use of SEM techniques in the study of emotional adjustment following mild TBI afford many benefits, however larger samples are needed to assure that the power to reject inaccurate models is obtained and that final structural models have adequate stability and replicability. Second, future studies should strive to enroll more demographically diverse samples from different clinical settings in order to increase the potential generalizability of results.

Future studies should use face-to-face interview protocols when examining SAC constructs in persons with TBI. Given the nature of cognitive deficits following TBI, such a methodological shift may decrease the likelihood of misunderstood items and, thus, increase the likelihood of obtaining reliable data. Further, such a methodological approach would better help establish rapport between the researcher and a participant as compared the telephone interview protocol used in the current study.

Finally, future studies using longitudinal, experimental, and qualitative designs would provide strong contributions to the post-TBI emotional adjustment literature. Longitudinal studies would afford researchers and clinicians the opportunity to follow a person's emotional recovery from acute phases, through psychological or neurobehavioral rehabilitation to long-term adjustment outcomes. Experimental studies

would enable researchers to evaluate the efficacy of cognitive behavioral interventions during post-TBI adjustment. Finally, the use of qualitative methods would expand the depth and richness of the understanding of emotional adjustment following TBI. Studies examining SAC variables using qualitative methodologies such as Consensual Qualitative Research (Hill et al., 1997), would allow researchers to expand the post-TBI emotional adjustment theoretical and clinical literature while maintaining scientific rigor.

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APPENDIX A
Stress, Appraisal, and Coping Following Mild Traumatic Brain Injury

The purpose of this letter is to ask for your participation in a study being conducted by researchers at Michigan State University, Stress, Appraisal, and Coping Following Mild Traumatic Brain Injury. The purpose of this study is to examine individual's adjustment following traumatic brain injury. It is believed that the project will assist in a better understanding of the events that aid in a person's adjustment following injury.

If you are willing to participate in this study, researchers will obtain select test scores from your medical file and you will be asked to complete a series of questionnaires that will ask questions about your health, your problem solving and your satisfaction with life in general. On average, the questionnaires will take approximately *15 minutes to complete.*

Your privacy will be protected to the maximum extent allowable by law. The following precautions will be taken to protect your confidentiality: No individual names or other identifying information will be used in any reports or publications that may result from this study, your name will not be connected to any of your answers, and researchers will have access only to the selected materials for the length of this study (less than one year).

Your participation in the study would be greatly appreciated. However, your participation in this study is voluntary; you may refuse to participate, refuse to answer certain questions or discontinue your participation at any time without penalty. If you have any questions concerning this study, please contact: John Kosciulek, Ph.D. (jkosciul@msu.edu or 517-353-9443) at 435 Erickson Hall, East Lansing, MI 48824 or Thad Strom, M.A. (stromtha@msu.edu or 517-694-7852) at 401C Erickson Hall, East Lansing, MI 48824. If you have questions about your rights as a participant, contact the chairperson of the University Committee on Research Involving Human Subjects (Dr. Peter Vasilenko at 517-355-2180, email: ucrihs@msu.edu), or by writing: Committee on Human Research, 202 Olds Hall, East Lansing, MI 48824-1046.

I understand my rights as a participant and willingly agree to participate

Signed _____

Date _____

APPENDIX B

Hello, my name is Thad Strom. I am a graduate student at Michigan State University I am contacting you regarding a study I am conducting examining people's adjustment following head injury. You should have received a brief letter warning that I would be contacting you.

Before we begin, MSU policy requires that I read you a brief consent statement:
If you agree to be in this study, I will be asking you a series of questions about your health, your problem solving and your satisfaction with life in general. The whole interview will take about twenty minutes to complete. There are no known risks involved in participating in the interview, however you are free to decline to answer any questions you do not wish to answer or to stop the discussion at any time.

Your answers during the interview will be protected to the maximum extent under law. No names will be used in any reports or publications that may result from this study, and your name will not be connected to any of your answers.

Your participation in this study is voluntary; you may decline to participate without penalty, and if you decide to participate, you may withdraw from the study at anytime.

Do you have any questions regarding your rights?

Okay, if you understand what I've just read and consider yourself to be fully informed about this research study, please acknowledge now by stating

Yes, I'll participate, or
No, I don't want to participate.

If No, okay, thank-you for your time, and have a nice (afternoon, evening)

If Yes, okay, thank-you, we'll now begin with the questions.

APPENDIX C

Stress, Appraisal, and Coping Following Mild Traumatic Brain Injury

The purpose of this letter is to ask for your participation in a study being conducted by researchers at Michigan State University, Stress, Appraisal, and Coping Following Mild Traumatic Brain Injury. The purpose of this study is to examine individual's adjustment following traumatic brain injury. It is believed that the project will assist in a better understanding of the events that aid in a person's adaptation following injury.

If you are willing to participate in this study, researchers will obtain select test scores from your medical file and you will be asked to complete a series of questionnaires that will ask questions about your health, your problem solving and your satisfaction with life in general. On average, the questionnaires will take approximately *20 minutes to complete.* As compensation for your time, after completing questionnaires, you will be mailed a brief thank you letter and a *$10 cash payment.* Additionally, your participation in this study may contribute to the understanding of the adjustment process individual's go through following traumatic brain injury.

Your privacy will be protected to the maximum extent allowable by law. The following precautions will be taken to protect your confidentiality: No individual names or other identifying information will be used in any reports or publications that may result from this study, your name will not be connected to any of your answers, and researchers will have access only to the selected materials for the length of this study (less than one year).

Your participation in the study would be greatly appreciated. However, your participation in this study is voluntary; you may refuse to participate, refuse to answer certain questions or discontinue your participation at any time without penalty. While the risks associated with completing this study are considered minimal, the potential exists for you to experience stress while discussing your current adjustment process. If you have any questions concerning this study, please contact: John Kosciulek, Ph.D. (jkosciul@msu.edu or 517-353-9443) at 435 Erickson Hall, East Lansing, MI 48824 or Thad Strom, M.A. (stromtha@msu.edu or 517-694-7852) at 401C Erickson Hall, East Lansing, MI 48824. If you have questions about your rights as a participant, contact the chairperson of the University Committee on Research Involving Human Subjects (Dr. Peter Vasilenko at 517-355-2180, email: ucrihs@msu.edu), or by writing: Committee on Human Research, 202 Olds Hall, East Lansing, MI 48824-1046.

I understand my rights as a participant and willingly agree to participate

Signed _____

Date _____

APPENDIX D

PATIENT AUTHORIZATION FOR DISCLOSURE

Patient Name: _____
Address: _____
Date of Birth: _____
SS#: _____

I AUTHORIZE THE DISCLOSURE OF MY HEALTH INFORMATION

FROM: PAR Rehab Services	TO: John Kosciulek and Thad Strom
Name of hospital or health care system or provider	Name of researcher or research group
3960 Patient Care Drive	401C Erickson Hall
Address	Address
Lansing, MI 48911	East Lasing, MI 48824
Phone (517) 887-9812	Phone (517) 694-7852
Phone/Fax Number	Phone/Fax Number

DESCRIPTION OF INFORMATION TO BE DISCLOSED (select one of the following):
___ALL information contained in my medical record.

OR

_X_ ONLY disclose the following information: Relevant Contact Information, WAIS-III Subtest Scores, WMS-III Subtest Scores
RESEARCH STUDY FOR THIS DISCLOSURE:
Title of Study: Stress Appraisal and Coping Following Mild Traumatic Brain Injury
Name of Research Leader: John Kosciulek, Ph.D.
Affiliation of Researcher: Michigan State University
IRB# *02-842*
Name of IRB Michigan State University UCRIHS

EXPIRATION (fill in one of the following):
Your Authorization to disclose the above information expires on August, 2005

REVOCATION, REFUSAL, REDISCLOSURE:
You may revoke this Authorization in writing at any time by contacting PAR Rehab Services
(e.g., the healthcare system or provider or hospital named above) , but it will not affect any information already released to the researcher(s).

You may refuse to sign this authorization and your refusal will not affect your ability to obtain treatment, however, it may affect your ability to participate in this research study.

Your information that is disclosed to the researcher(s) may no longer be protected by Federal privacy regulations if the researcher(s) is not a health care provider covered by the regulations, however the researcher(s) agrees to protect your information as required by law.

_____

Signature of Patient or Personal Representative Date

APPENDIX E

Directions: The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way.

For each question choose from the following alternatives:

	Never	Almost Never	Sometimes	Fairly Often	Very Often
1. In the last month, how often have you been upset because of something that happened unexpectedly?	1	2	3	4	5
2. In the last month, how often have you felt that you were unable to control the important things in your life?	1	2	3	4	5
3. In the last month, how often have you felt nervous or "stressed"?	1	2	3	4	5
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	1	2	3	4	5
5. In the last month, how often have you felt that things were going your way?	1	2	3	4	5
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	1	2	3	4	5
7. In the last month, how often have you been able to control irritations in your life?	1	2	3	4	5
8. In the last month, how often have you felt that you were on top of things?	1	2	3	4	5
9. In the last month, how often have you been angered because of things that were outside of your control?	1	2	3	4	5
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	1	2	3	4	5

APPENDIX F

Directions: Read each item carefully. Using the scale shown below, please circle the number that best describes YOU.

	definitely false	mostly false	mostly true	definitely true
1. I can think of many ways to get out of a jam	1	2	3	4
2. I energetically pursue my goals.	1	2	3	4
3. I feel tired most of the time.	1	2	3	4
4. There are lots of ways around any problem.	1	2	3	4
5. I am easily downed in an argument.	1	2	3	4
6. I can think of many ways to get the things in life that are most important to me.	1	2	3	4
7. I worry about my health.	1	2	3	4
8. Even when others get discouraged, I know I can find a way to solve the problem.	1	2	3	4
9. My past experiences have prepared me well for my future.	1	2	3	4
10. I've been pretty successful in life.	1	2	3	4
11. I usually find myself worrying about something.	1	2	3	4
12. I meet the goals that I set for myself.	1	2	3	4

APPENDIX G

Directions: The following inventory contains statements about how people think, or feel about their ability to solve personal problems like feeling depressed, getting along with friends, or deciding whether to get a divorce.

Indicate to what extent you agree with each statement using the following scale.

	Strongly Agree					Strongly Disagree
1.. When a solution to a problem was unsuccessful, I do not examine why it didn't work.	1	2	3	4	5	6
2. When I am confronted with a complex problem, I do not bother to develop a strategy to collect information so I can define exactly what the problem is.	1	2	3	4	5	6
3. When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation.	1	2	3	4	5	6
4.After I have solved a problem, I do not analyze what went right or what went wrong.	1	2	3	4	5	6
5. I am usually able to think up creative and effective alternatives to solve a problem.	1	2	3	4	5	6
6. After I have tried to solve a problem with a certain course of action, I take time and compare the actual outcome to what I thought should have happened.	1	2	3	4	5	6
7. When I have a problem, I think up as many possible ways to handle it as I can until I can't come up with any more ideas.	1	2	3	4	5	6
8. When confronted with a problem, I consistently examine my feelings to find out what is going on in a problem situation.	1	2	3	4	5	6

9. When confused about a problem, I don't clarify vague ideas or feelings by thinking of them in concrete terms.	1	2	3	4	5	6
10. I have the ability to solve most problems even though initially no solution is immediately apparent.	1	2	3	4	5	6
11. Many problems I face are too complex for me to solve.	1	2	3	4	5	6
12. When solving a problem, I make decisions that I'm happy with later on.	1	2	3	4	5	6
13. When confronted with a problem, I tend to do the first thing that I can think of to solve it.	1	2	3	4	5	6
14. Sometimes I do not stop and take time to deal with my problems, but just kind of muddle ahead.	1	2	3	4	5	6
15. When considering solutions to a problem, I do not take time to assess the potential success of each alternative	1	2	3	4	5	6
16. When confronted with a problem, I stop and think about it before deciding on a next step.	1	2	3	4	5	6
17. I generally act on the first idea that comes to mind in solving a problem.	1	2	3	4	5	6
18. When making a decision, I compare alternatives and weigh the consequences of one against the other.	1	2	3	4	5	6
19. When I make plans to solve a problem, I am almost certain that I can make them work.	1	2	3	4	5	6

20. I try to predict the result of a particular course of action.	1	2	3	4	5	6
21. When I try to think up possible solutions to a problem, I do not come up with very many alternatives.	1	2	3	4	5	6
22. When trying to solve a problem, one strategy I often use is to think of past problems that have been similar.	1	2	3	4	5	6
23. Given enough time and effort, I believe I can solve most problems that confront me.	1	2	3	4	5	6
24. When faced with a novel solution I have confidence that I can handle problems that may arise.	1	2	3	4	5	6
25. Even though I work on a problem, sometimes I feel like I am groping or wandering, and am not getting down to the real issue.	1	2	3	4	5	6
26. I make snap judgments and later regret them.	1	2	3	4	5	6
27. I trust my ability to solve new and difficult problems.	1	2	3	4	5	6
28. I use a systematic method to compare alternatives and make decisions.	1	2	3	4	5	6
29. When thinking of ways to handle a problem, I seldom combine ideas from various alternatives to arrive at a workable solution.	1	2	3	4	5	6
30. When faced with a problem, I seldom assess the external forces that may be contributing to the problem.	1	2	3	4	5	6

31. When I am confused by a problem, one of the first things I do is survey the situation and consider all of the relevant pieces of information.	1	2	3	4	5	6
32. Sometimes I get so charged up emotionally that I am unable to consider many ways of dealing with my problems.	1	2	3	4	5	6
33. After making a decision, the outcome I expected usually matches the actual outcome.	1	2	3	4	5	6
34. When confronted with a problem, I am unsure of whether I can handle the situation.	1	2	3	4	5	6
35. When I become aware of a problem, one of the first things I do is to try to find out exactly what the problem is.	1	2	3	4	5	6

APPENDIX H

Instructions: The questionnaire below consists of 21 groups of statements. I will read each group of statements, and I'd like you to pick one statement in each group that best describes the way you have been feeling during the past two weeks, including today.

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

2. Pessimism
   - 0 I am not discouraged about my future
   - 1 I feel more discouraged about my future than I used to be
   - 2 I do not expect things to work out for me.
   - 3 I feel my future is hopeless and will only get worse.

3. Past Failure
   - 0 I do not feel like a failure
   - 1 I have failed more than I should have.
   - 2 As I look back, I see a lot of failures.
   - 3 I feel I am a total failure as a person.

4. Loss of Pleasure
   - 0 I get as much pleasure as I ever did from the things I enjoy.
   - 1 I don't enjoy things as much as I used to.
   - 2 I get very little pleasure from the things I used to enjoy.
   - 3 I can't get an pleasure from the things I used to enjoy.

5. Guilty Feelings
   - 0 I don't feel particularly guilty.
   - 1 I feel guilty over many things I have done or should have done.
   - 2 I feel quite guilty most of the time.
   - 3 I feel guilty all of the time.

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

7. Self-Dislike
   - 0 I feel the same about myself as ever.
   - 1 I have lost confidence in myself.
   - 2 I like myself less than before.
   - 3 I dislike myself.

8. Self-criticalness

0 I don't criticize or blame myself more than usual.
1 I am more critical of myself than I used to be.
2 I criticize myself for all my faults.
3 I blame myself for everything bad that happens.

9. Suicidal Thoughts or Wishes

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

10. Crying

0 I don't cry anymore than I used to.
1 I cry more than I used to.
2 I cry over every little thing.
3 I feel like crying, but I can't.

11. Agitation

0 I am no more restless or wound up than usual.
1 I feel more restless or wound up than usual.
2 I am so restless or agitated that it's hard to stay still.
3 I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest

0 I have not lost interest in other people or activities.
1 I am less interested in other people or things than before.
2 I have lost most of my interest in other people or things.
3 It's hard to get interested in anything.

13. Indecisiveness

0 I make decisions about as well as ever.
1 I find it more difficult to make decisions than usual.
2 I have much greater difficulty in making decisions than I used to.
3 I have trouble making any decisions.

14. Worthlessness

0 I do not feel I am worthless.
1 I don't consider myself as worthwhile and useful as I used to.
2 I feel less worthwhile as compared to other people.
3 I feel utterly worthless.

15. Loss of Energy

0 I have as much energy as ever.

1 I have less energy than I used to have.
2 I don't have enough energy to do very much
3 I don't have enough energy to do anything.

16. Changes in Sleeping Pattern
0 I have not experienced any change in my sleeping pattern.
1a I sleep somewhat more than usual.
1b I sleep somewhat less than usual.
2a I sleep a lot more than usual.
2b I sleep a lot less than usual.
3a I sleep most of the day.
3b I wake up 1-2 hours early and can't get back to sleep.

17. Irritability
0 I am no more irritable than usual.
1 I am more irritable than usual.
2 I am much more irritable than usual.
3 I am irritable all the time.

18. Changes in Appetite
0 I have not experienced any change in my appetite.
1a My appetite is somewhat less than usual.
1b My appetite is somewhat greater than usual.
2a My appetite is much less than before.
2b My appetite is much greater than usual.
3a I have no appetite at all.
3b I crave food all the time.

19. Concentration Difficulty
0 I can concentrate as well as ever.
1 I can't concentrate as well as usual.
2 It's hard to keep my mind on anything for very long.
3 I find I can't concentrate on anything.

20. Tiredness or Fatigue
0 I am no more tired or fatigued than usual.
1 I get more tired or fatigued more easily than usual.
2 I am too tired or fatigued to do a lot of the things I used to do.
3 I am too tired or fatigued to do most of the things I used to do.

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

APPENDIX J

1. How often do you travel outside the home? (circle the correct number)

Almost every day	Almost every week	Seldom/never (less than once per week)
2	1	0

2. Please check the answer below that best corresponds to your current (during the past month) work situation:

_____ full-time (more than 20 hours per week)
_____ part-time (less than or equal to 20 hours per wk)
_____ not working, but actively looking for work
_____ not working, not looking for work
_____ not applicable, retired due to age

3. Please check the answer below that best corresponds to your current (during the past month) school or training program situation:

_____ full time
_____ part-time
_____ not attending school or training program
_____ not applicable/retired due to age

4. In the past month, how often did you engage in volunteer activities?
_____ 5 or more
_____ 1-4 times
_____ never

5. What is the highest level of education that you completed?

5a. Did you receive a degree (if yes, what degree?)

6. What is your Race/ Ethnicity? (Please circle all that apply)
African/ African American
Asian/ Asian American
Caucasian/ European American
Hispanic/ Hispanic American
Native American
Other

7. What is your name and date of birth? (mm/dd/yy)

Thank You For Your Assistance