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The Effects of Coping Styles and Perceived Stress on Clinical Outcomes in Individuals with Moderate to Severe Brain Injury in a Post-Acute Rehabilitation Program

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THE EFFECTS OF COPING STYLES AND PERCEIVED STRESS ON CLINICAL

OUTCOMES IN INDIVIDUALS WITH MODERATE TO SEVERE BRAIN INJURY

IN A POST-ACUTE REHABILITATION PROGRAM

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Submitted in Partial Fulfillment of the Requirements for the Degree of

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Dissertation Approval

This is to certify that the thesis presented to us by _____

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acceptable in both scholarship and literary quality.

Committee Members' Signatures:

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Abstract

The present study investigated the effects of different coping styles used by individuals with moderate to severe brain injury on their clinical outcomes. Specifically, using self-report measures, this study evaluated the use of task-oriented, avoidance, and emotion-oriented coping and how these different styles influenced patients' perceived stress and depression levels. In addition, task-oriented coping style has previously been deemed as a more adaptive way of dealing with life challenges. Hence, through a retrospective examination of archival records, this study also evaluated patients' adjustment (i.e., observed mood lability and social contact), participation (i.e., observed ability to initiate tasks, interact with others, and manage life responsibilities), and executive functioning (i.e., decision-making and abstract reasoning skills) abilities to determine if individuals with a greater number of intact abilities in these areas were in fact relying more on task-oriented coping. Multiple regression analyses of the data from 32 participants revealed that the use of task-oriented coping was significantly correlated with lower levels of depression and stress. The use of task-oriented coping, however, was not predicted by more intact participation, adjustment, or executive functioning abilities. Last, it was found that adjustment and participation made significant contributions to the prediction of perceived stress.

Keywords: acquired brain injury, coping styles, MPAI-4, NAB Judgment test, executive functioning, post-acute rehabilitation

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Chapter 1: Introduction

It has been established that moderate to severe brain injury can cause cognitive, physical, and emotional deficits that are difficult to manage. Because brain injury can affect different areas of executive functioning such as appraisal, individuals often do not have an adequate perception of the extent of these limitations (Krpan et al., 2013; Krpan et al., 2007). As a result, they may use more maladaptive coping strategies (emotional responses, including anger and worry, and avoidance, such as denial and ignoring the problem) to deal with daily life challenges (Anson & Posford, 2006; Finset & Anderson, 2000). On the other hand, using problem-solving strategies that aim to face challenging life situations while actively looking for resources has been deemed more adaptive to manage stressors (Tomberg et al., 2005; Curran et al., 2000).

The literature has suggested that individuals who use maladaptive/negative coping styles (avoidance and emotion-focused) to deal with life problems have poorer psychosocial outcomes and lower productivity (Finset & Anderson, 2000; Lubosko, Moore, Stambrook, & Gill, 1994); however, those individuals who use less emotion-focused and avoidance coping styles tend to have better psychosocial outcomes (Malia, Powell, & Torode, 1995; Velikonja et al., 2013).

According to the Stress-Appraisal Coping Model, stress perceptions and coping strategies can predict emotional adjustment in patients with a variety of medical conditions. To this day, however, these correlations have not been thoroughly studied in post-acute rehabilitation settings with a moderate to severe brain injury populations. Also, many previous research studies have relied heavily only on self-reports, without

taking into consideration the effects of impairments in awareness for many of these individuals, which can lead to inaccurate findings (Fischer et al., 2004; O'callaghan et al., 2006). This study attempted to account for these limitations by also assessing whether or not task-oriented coping style was correlated with more intact adjustment and social participation scores in a post-acute rehabilitation setting using objective measures (instruments rated by a treatment team). Similarly, it assessed whether or not higher executive functioning scores on neuropsychological testing were predictive of greater reliance on problem-solving (task-oriented) coping style.

Purpose of the Study

The present study was designed to evaluate: 1) how perceived levels of stress and coping style impact mood in individuals with moderate to severe brain injury who are living in the post-acute phases of recovery. Using Godfrey and colleagues' (1996) modified model of stress-appraisal-coping for this type of population, specific cognitive determinants (perceived levels of stress) and three main coping strategies (task-oriented, emotion-oriented, avoidance) were evaluated to determine how they influenced emotional symptomology (depression) in individuals with acquired brain injury.

It has been suggested that cognitive rehabilitation should focus on training more problem-focused coping styles in the chronic phase post-injury (Krpan et al., 2007; Tomberg et al., 2005; Wilson, 2000). Therefore, the second goal of this study was to determine: 2) whether or not task-oriented (problem-solving) coping style was indeed a more adaptive way of coping for this population by examining its relationship to participation, adjustment, and executive functioning ability. That is, previous research suggests that task-oriented coping strategies lead to better treatment outcomes (Wood

Doughty, 2013; Compas, Malcarne, & Fondacaro, 1988). Therefore, it was expected that

higher executive functioning ability, and better participation and adjustment would

predict greater use of task-oriented coping. Because coping styles have been found to be

amenable to cognitive rehabilitation (Anson & Posford, 2006; Wolters et al., 2010), the

goal was to identify which coping strategy was most closely associated with better

clinical outcomes for this population sample.

Chapter 2: Literature Review

Traumatic Brain Injury: Prevalence, Types, and Costs

In the United States, Traumatic Brain Injury (TBI) accounts for approximately 30 % of all injury-related deaths, with almost 140 people dying every day from injuries related to TBI (Center for Disease Control and Prevention, 2014). Those who survive are at risk for experiencing ramifications that can range from short-term, mild consequences to long lasting, devastating effects. Such brain injuries can impact an individual's emotional, cognitive, physical, interpersonal, societal, occupational, and vocational functioning.

A traumatic brain injury is caused by a bump, shock, or blow to the head or by a penetrating injury that interrupts the regular functioning of the brain. The gravity of the shock, the area of the brain affected, and many other unique variables of the individual will determine the magnitude of the brain injury. The severity of a brain injury can fall anywhere in the spectrum, from mild to severe (CDC, 2014; Blumenfeld, 2010). In the brain, easily detectable changes include hematomas and hemorrhagic contusions. Although injuries can be dispersed anywhere in the brain, prefrontal and anterior temporal contusions are most common. These injuries are often superimposed on diffuse axonal injury (Jennett, & Teasdale, 1981; Gentry, 1991; Prigatano, 2005).

According to the Brain Injury Association of America (BIAA, 2012), a traumatic brain injury can be defined as a disturbance to the functioning of the brain that is caused by an external force. An acquired brain injury is described as an injury to the brain that is not hereditary, is congenital, degenerative, or produced by birth trauma. In other words, it

is any injury to the brain that was sustained after birth. By definition, any traumatic brain injury can be considered an acquired brain injury.

Traumatic brain injuries can be pervasive and cause significant lifestyle changes, which can lead to death or disability. In 2010 alone, 2.5-million brain injury-related incidents were reported (CDC, 2014). It has been documented that from 2006 to 2010, the leading causes were falls, accounting for up to 40% of TBIs in the United States. This is true among all age groups, including children ages 0-14 whose fall incidents accounted for 50% of all TBIs, and for 61% of adults over 65 years old. Unintentional blunt trauma, motor vehicle accidents, and assaults accounted for 16%, 14%, and 11% of TBIs, respectively. Motor vehicle accidents resulted in the largest number of TBI-related deaths for all age groups. Each year men have more than twice the rate of TBI-related deaths than women. Individuals affected included those presenting with TBI-related injuries that resulted in ED visits, hospitalizations, or death (CDC, 2014). It has been estimated that the cost of TBIs in the United States, including direct medical costs and indirect costs of lost productivity is more than 60 billion dollars per year (Faul, Likang, Wald, & Coronado, 2010).

Brain injury is associated with a diverse range of impairments that affect thought processes, physical abilities, behaviors, and emotions. Those with mild brain injury have better prognoses and are expected to recover without major difficulties; however, moderate and severe brain injury typically result in more serious consequences (BIAA, 2012). Following moderate or severe brain injury, some individuals experience complete permanent incapacity, yet others with analogous clinical characteristics may regain some skills (Perel et al., 2008).

Such heterogeneity in outcome has been attributed to unique patient characteristics, injury-specific factors, and physiological deficits encountered in the acute setting (Schneider et al., 2014; Lipton et al., 2009). Poor prognostic factors include: injury at an older age, lower premorbid education level, pre-injury psychiatric and substance abuse diagnoses, lower Glasgow coma scores, absent pupil reactivity, extracranial injury, brainstem reflexes, and the presence of post-traumatic hypotension (Chestnut et al., 2000; Perel et al., 2008; Braunling-McMorrow, Dollinger, Gould, Neumann, & Heiligenthal, 2010).

The terms used to define brain injury vary amongst researchers and have evolved over time. The Glasgow Coma Scale (GCS) is a widely used tool to assess the severity of brain injury (CDC, 2014). It provides a bedside measure of eye response (ranging from no response to spontaneous ability), verbal response (ranging from no response to full ability to communicate), and motor response (ranging from no response to full ability to obey commands) following a brain injury and helps determine the course of action (Teasdale & Jennett, 1974).

Individuals with GCS of 13 to 15 are classified with a mild brain injury. Generally, mild brain injury, also known as concussion, has been described as a period of transient diminished consciousness following a reversible impairment of neurologic function for a period of minutes to hours (Lipton et al., 2009). Usually, such alteration in consciousness lasts no more than 30 minutes, and can result in posttraumatic amnesia (PTA) for less than 24 hours. These do not produce skull fractures, abnormalities in structural brain imaging, or focal neurological signs (Schretlen & Shapiro, 2003; Perel et al., 2008).

Clinical features involve loss of consciousness, headaches, dizziness, fatigue, poor concentration and memory, nausea, and/or vomiting (Blumenfeld, 2010). It is unclear whether or not such uncomplicated concussions contribute to any permanent brain damage. Whereas the majority of patients do not suffer from severe repercussions after enduring a concussion, some individuals with such injuries endorse persisting symptoms involving concentration, attention, memory, and others issues (Schretlen & Shapiro, 2003).

Moderate brain injury happens when the loss of consciousness lasts from a few minutes to hours, with periods of confusion continuing from days to weeks. These usually generate a Glasgow Coma Scale score between 8 and 12. Severe brain injury occurs when a protracted unconscious state or coma lasts from days to months (BIAA, 2012). Typically, patients with GCS scores of 3 to 8 are classified with severe brain injury, which can cause more permanent impairments in overall functioning (Wallesch, Curio, Kutz, Jost, Bartels, & Synowitz, 2001).

Recovery, Prognosis, and Treatment

The literature often offers mixed reviews in terms of outcomes, post-brain injury. As expected, every individual presents with unique factors that can determine whether or not improvements or declines should be estimated within a certain time frame. Therefore, the detection of change is dependent upon the way in which these are characterized and on the instruments that are utilized to measure any changes.

Generally, studies have found that following severe brain injury, significant recovery of cognitive functioning occurs during the initial year following the brain injury (Malec, Smigielski, Depompolo, & Thompson, 1993; Braunling-McMorrow et al., 2010).

However, cognitive recovery may best be described as an asymptotic curve, whereby speeded recovery is present within the first 5 months, post-injury. This is followed by a phase of comparatively fewer gains in cognitive functioning over the latter part of the year. Yet it is also evident that there is significant variability in recovery across different cognitive domains, as well as between patients (Christensen et al., 2008). Understanding the long-term prognosis of cognitive deficits and social communication is particularly important because of evidence that these types of complications can significantly interfere with return to work and to community reintegration (Hammond, Hart, Bushnik, Corrigan, & Sasser, 2004).

Conventionally, brain injury has been conceptualized as an isolated event (the injury), followed by an extended, yet circumscribed recovery period. Such recovery period is expected to involve gradual gains in functioning, a below pre-injury level of functioning phase, and subsequent maintenance of gains (Tomaszczyk et al., 2014). The long-term trajectory of brain injury hardly ever follows this predictable path of recovery, however. Instead, some patients can suffer cognitive decline rather than the expected improvements during the earlier and the chronic stages of the injury. Others can continue showing improvements in cognitive functioning that are subtle and at times go unnoticed (Schneider et al., 2014; Wallesch et al., 2001).

A myth exists that substantial change does not happen after a year. Contrary to these beliefs, however, some studies have found continued improvements as late as 2 years following the brain injury (Hammond et al., 2004; Schretlen & Shapiro, 2003; Christensen et al., 2008). The incongruity between findings may be attributable to the inconsistency across studies with regard to study design and outcome measures. Using

global measures, for instance, may limit one's sensitivity to spot particular, subtle deficits in individual areas of functioning (Christensen et al., 2008).

Assumptions that the individual has reached a plateau result in feelings of anxiety, depression, and loss of hope for the patients and their families (Jorge & Arciniegas, 2014). Indeed, seeing patients emerge from a coma and transition into being able to walk and communicate constitutes a tremendous amount of change that is more easily observable and measurable. Although less obvious and more difficult to assess, there are minor signs of progress in areas of behavior, attention, memory, and language which are equally meaningful, post-injury recovery because they continue contributing to improvements in quality of life (Hammond et al., 2004).

Non-traumatic Brain Injury

Non-traumatic brain injury occurs due to internal abnormalities that ultimately affect brain functioning. One of the most common non-traumatic brain injuries is stroke, given the fact that is it currently he fifth leading cause of death in the United States (CDC, 2014), and can result in long-lasting, detrimental consequences. There are three types of stroke: 1) Ischemic, accounting for approximately 87 % of all strokes, and occurring when blood flow becomes blocked and hinders the supply of oxygen-rich blood to the brain; 2) Hemorrhagic, which can be caused by an artery that leaks blood or has been ruptured, and 3) Transient Ischemic Attack, classified as "mini-strokes"; these are short-lasting (no longer than five minutes) episodes, during which blood supply to the brain is only temporarily obstructed (CDC, 2014).

Moreover, bacterial meningitis can cause brain damage. Several types of bacteria can cause this infection, including Streptococcus Pneumoniae, Group B Streptococcus,

and Neisseria Meningitides, among others. Complications can involve seizures, cranial

neuropathies, cerebral edema, hydrocephalus, herniation, cerebral infarcts, and even

death (Blumenfeld, 2010). Other non-traumatic brain injuries can result from illness,

oxygen deprivation, cardiac arrest, metabolic disorders, aneurysms, virus, infection,

tumors, hydrocephalus, and more (CDC, 2014).

Cognitive deficits

Acquired brain injury has been associated with enduring and debilitating

cognitive impairments, specifically in areas of memory, attention, executive functioning,

and emotional regulation (Adnan, Crawley, Mikulis, Moscovitch, Colella, & Green,

2013). Although individuals with mild brain injury can experience some of these

symptoms, it is those with more severe brain injury that demonstrate clearly evident

deficits in these areas. Typically after moderate to severe brain injury, patients experience

deficiencies across a range of cognitive functions. Common impairments occur in areas

of attention and speed of processing, psychomotor skills, learning and memory, verbal

and visuospatial skills, fluid intellectual functioning, and a range of executive functioning

abilities mediated by the frontal lobe (Scheid, Walther, Guthke, Preul, & von Cramon,

2006; Christensen et al., 2008).

Because the frontal lobes of the brain are the most common areas affected when

an individual sustains a brain injury, executive impairments are common (Lezak,

Howieson, Bigler, & Tranel, 2012). These are also persistent over time, with a large

number of patients demonstrating deficits in these areas several years post trauma (Tate

et al., 2014). Impairments in executive functioning can exert a profound impact on daily

living because they have been found to predict functional and psychosocial outcomes

(Schretlen & Shapiro, 2003). More specifically, poor behavioral regulation, which is a key component of executive functioning, is an important predictor of function in interpersonal relationships and independent living (Scheid et al., 2006).

Executive functioning abilities involve a vast array of complex behaviors that are required to respond in adaptive ways to novel situations, and are the basis of multiple cognitive, emotional, and social abilities. Executive functioning has been conceptualized as having four main components: 1) volition, 2) planning and decision making, 3) purposive action, and 4) affective performance, with each area encompassing a unique set of activity related behaviors (Lezak et al., 2012). Although these executive functions are crucial for appropriate, socially responsible adult conduct, they are highly intricate, and changes in these skills can be missed in highly structured testing environments.

Impairments in self-regulation and self-direction typically involve a cluster of deficits in at least one or two facets of executive functioning, and it can be difficult to examine all aspects within this cognitive domain in any given individual (Lezak et al., 2012). More specifically, the challenge is to measure discretionary behavior, self-regulation, self-imposed structure, goal setting, and decision-making abilities within highly structured testing environments. In addition, at this time there is no single test that can systematically assess these many areas of executive functioning. Instead, wide range assessment batteries are typically used to obtain a more comprehensive measure of these executive functions (Lezak et al., 2012).

Although it has been established that some degree of recovery happens across cognitive domains, the intradomain consistency and chronological characteristics of such restoring processes remain variable. That is, different areas of cognitive functioning

recover independently over time (Wallesch et al., 2001; Schretlen & Shapiro, 2003). For instance, learning and memory, complex attention, speed of processing, and some language functions typically show very slow, minimal recovery. Conversely, visual perceptual skills and verbal intelligence recover comparatively more rapidly (Fork, Bartels, Ebert, Grubich, Synowitz, & Wallesch, 2005).

Neuroanatomy of Brain Injury

The cause of neuropsychological deficits is usually attributable to the effects of the injury because the impact of acceleration, deceleration, and rotational forces result in a multitude of detrimental events. Acute events can include shearing and transection of axons and blood vessels along with contusions and lacerations (Blumenfeld, 2010; Perel et al., 2008). Minutes to days later, metabolic, excitotoxic and hypoxic damage, inflammation edema, reduction to cerebral blood flow and hemorrhage can be seen, causing more long-lasting damage (Lipton et al., 2009; Adnan et al., 2013).

Even though acute events alone can significantly impact the brain, there is growing evidence that there is additional damage that occurs at some point after the acute phase has resolved. These can include losses to white and grey matter tissue in human adults in the sub-acute and chronic stages of injury, reductions in volume of the whole brain and hippocampus, and lesion expansion. Additionally, loss of white matter integrity (i.e. abnormalities in myelination along the axonal tracts) in deep frontal and temporal regions has been found in patients with moderate to severe brain injury up to 30 months after the incident (Arenth, Russell, Scanlon, Kessler, & Ricker, 2014).

Although brain injuries are very heterogeneous, it has been largely recognized that the most common pathophysiological change persevering in the chronic stage of

survival is diffuse axonal injury (DAI). This refers to the chronic disruption of axons that result from indirect or direct consequences of mechanical trauma (Lipton et al., 2009; Arenth et al., 2014). DAI has been identified as the key factor to persistent cognitive problems following head trauma. It has been reported that a 5% loss of functioning due to axonal injury can lead to decreased attention and decreased working memory skills, which has downstream effects on storage and retrieval memory processes, and on the ability to process verbal and nonverbal information (Benson et al., 2012).

In addition, patients who exhibit persistent decreases in self-awareness several months or years after the injury often show evidence of bilateral and asymmetrical lesions throughout the brain, including the brainstem and cerebellum. The degree of injury severity and the age of individuals at injury are the factors most strongly associated with the level of cognitive impairment (Spitz, Ponsford, Rudzki, & Maller, 2012). Moreover, other significant factors related to later outcomes were age, premorbid personality, stability of family background, and pre-injury occupation (Hammond et al., 2004).

Psychiatric Comorbidities in the Brain Injury Population

Psychological and psychosocial problems are among the most incapacitating sequelae of brain injury and can be exhibited in a wide range of emotional and behavioral disturbances (Anstey, Butterworth, Jorm, Christensen, Rodgers, & Windsor, 2004). The more severe are psychiatric disorders, which can be identified by the occurrence of symptoms such as delusions, hallucinations, mood disorders, and sustained or repeated irrational behaviors (van Reekum, Cohen, & Wong, 2000). Agitation, aggression, and confusion are also typically observed (Rapoport, 2012). Furthermore, survivors are at risk

for more serious, continuing psychiatric difficulties, including changes in personality, posttraumatic stress disorder, anxiety, mania, psychosis and depression (Jorge & Arciniegas, 2014; Rogers & Read, 2007).

Although different psychiatric disorders are quite prevalent in individuals with brain injury, depression symptoms have been found to be the most common for this population. Some studies suggest that up to 77% of patients suffer from depression-like complaints (Schretlen & Shapiro, 2003). In the early period following the injury, mood disturbances may simply reflect the results of neurotrauma on the distributed neural networks that produce and control emotion. Mood disorders can overlap with anxiety disorders, substance abuse, impulsivity, and aggression (Jorge & Arciniegas, 2014).

Depression has been linked to high rates of disability, compromised psychological functioning, and decreased quality of life and life satisfaction (Rogers & Read, 2007). Although the deleterious impact on mood has been well-established, diagnosing depression following brain injury is challenging because of the interplay of cognitive, somatic, and emotional symptoms (Rapoport, 2012). Common symptoms include poor concentration, slow thinking, sleeping issues, lability, and decreased energy and activity. These complaints can be attributable to an actual depression disorder, the acquired brain injury, the individual's pre-injury functioning, and/or medication side effects.

There is some evidence that depressed mood in those with brain injury is more frequently manifested by irritability, frustration, anger, and aggression, than by sadness, tearfulness, or melancholy (van Reekum et al., 2000; Rogers & Read, 2007). There are several theoretical issues in detecting the causal relationships between brain injury and an increased incidence of depression. The injury alone is not always the main reason for

depressive signs. These symptoms may stem from a third variable, or simply have a

higher likelihood of occurrence in those with pre-injury psychological conditions

(Fleminger, Oliver, Williams, & Evans, 2003). For instance, brain injury may result from

a motor vehicle accident that was associated with alcohol or drug problems comorbid

with depression.

Although prevalence rates for depression seem to be highest during the first year

after brain injuries, patients have been found to continue at elevated risk for several years

(Rapoport, 2012). Many of these individuals also are at a higher risk for suicidal thinking

and in most extreme cases, suicide attempts (Mainio, Kyllönen, Viilo, Hakko, Särkioja, &

Räsänen, 2007). A review of three studies on suicide risk over a 15-year period following

brain injury found that approximately 1% of individuals living with a brain injury

successfully committed suicide. This is almost 3 times the suicide rate for the general

population (Fleminger et al., 2003).

Although it is less common, many individuals with brain injury have been found

to suffer from other comorbid psychiatric complaints (Mooney & Speed, 2001). For

example, substance abuse has been reported in 22% of the population after acquiring the

brain injury, representing a 1.3-fold increase relative to the general population

(Vaishnavi, Rao, & Fann, 2009). The prevalence of substance misuse seems to increase

after the brain injury. Also, the prevalence of generalized anxiety disorder (GAD) has

been found to be as high as in 9% of patients. This represents a 2.3-fold increase relative

to the general population (van Reekum, Cohen, & Wong, 1999). Finally, up to 16% of the

brain injury population has endorsed symptoms that can meet the diagnostic criteria for

posttraumatic stress disorder (Bryant, Marosszeky, Crooks, & Gurka, 2000). Behavioral

manifestations can occur at any point after the acute phase of the brain injury.

Coping with these changes is challenging not only for the individuals, but also for their

family members and for the community in which they live (Hoofien et al., 2001).

Rehabilitation Programs for the Moderate to Severe Brain Injury Population

Rehabilitation for individuals with brain injury can be carried out in diverse

environments, ranging from acute settings to community settings (Grant & Ponsford,

2014). Neuropsychological rehabilitation involves a collaborative process, during which

professional staff, community advocates, and family members work together to provide

individuals who have brain injury with the best possible treatment outcomes (Mateer,

Sira, & O'Connell, 2005).

Thus, post-acute brain injury rehabilitation programs include several after-

hospital stay options, including residential community, reintegrated settings that provide

cognitive, emotional and behavioral management, leisure, vocational, and physical

treatment planning (Dahdah et al., 2014). Professionals working in these settings

recognize the significance of tailoring interventions to address the heterogeneity within

the brain injury population. As a result, these programs have been taking a holistic

approach, drawing together physical, psychological, and socio-environmental factors that

highlight well-being and quality of life (Medley, Powell, Worthington, Chohan, & Jones,

2010).

Many, if not most people with moderate to severe brain injury require

rehabilitation services for an extensive period of time. Several past studies that have

compared brain injury rehabilitation programs with no treatment or spontaneous recovery

suggest that those individuals in rehab settings have better post-injury outcomes (Dahdah et al., 2014; Hoenig, Sloane, Horner, Zolkewitz, & Reker, 2001; Brown, Malec, McClelland, Diehl, Englander, & Cifu, 2005).

Generally, those who enter rehabilitation earlier (within 1 year post-injury) tend to experience the greatest gains, although improvements are observed in those who receive more delayed interventions (Penna, Novack, Carlson, Grote, Corrigan, & Hart, 2010). Rehabilitation treatment programs have demonstrated pre- and post- improvements in terms of activities of daily living, behavioral functioning, vocational status, level of independence, and even an increase in community inclusion and return to work rates (Williams, Rapport, Millis, & Hanks, 2014). It has thus been demonstrated that individuals with brain injury benefited from these treatment settings even when rehabilitation services started a few years after the brain injury, and even when their clinical presentation involved significant behavioral disturbances (Braunling-McMorrow et al., 2010).

Factors that Influence Rehabilitation Outcomes

Although patients who receive rehabilitation treatment are in a more advantageous position than those who do not, there continue to be several challenges that can hinder the recovery process. Some of the typical obstacles to successful treatment in rehabilitation settings involve lack of participation and/or low levels of involvement in the treatment plan development (Maclean, Pound, Wolfe, & Rudd, 2000; Wood, 2001). These issues have been diversely attributed to cognitive, emotional, and neurobehavioral sequelae. Particularly, diminished self-awareness of deficits has been identified as one of the main factors for patient involvement (Medley & Powell, 2010).

Also, a more distorted perception of symptoms and lower perception of control can predict poorer engagement from the patient (Shotton, Simpson, & Smith, 2007; Medley et al., 2010). On the other hand, beliefs about serious consequences, perceived control, and a range of active problem-solving and emotion-focused coping strategies can lead to higher levels of engagement from the patient, and therefore, potential success in treatment outcomes (Velikonja, Warriner, Coulson, & Brum, 2013). Although these associations have largely been found in other rehabilitation populations, such as cardiac, orthopedic, and multiple sclerosis patients, similar correlations between perceived control and coping skills for brain injury patients have been emerging (Cooper, Lloyd, Weinman, & Jackson, 1999; Spain, Tubridy, Kilpatrick, Adams, & Holmes, 2007). The significance of establishing a clearer relationship between perceived control and coping styles would be important because it could potentially help to have a better understanding of the specific areas that need to be targeted during the development of treatment interventions.

Self Perceptions in Brain Injury

Disruptions in the brain, specifically multiple or diffuse lesions, often lead to prefrontal lobe damage. Because this area of the brain is largely responsible for executive functions that involve regulation, programming, and verification of mental activity, it is not surprising to see significant impairments in self-assessment, self-control, and self-perception abilities after brain injury (Tate et al., 2014).

Although deficiencies in self-awareness (insight, appraisals, perceptions) are common outcomes in moderate to severe brain injury, understanding this construct has been challenging because it is often defined in different ways (Bach & David, 2006). In operational terms, it has been described as a process in which the person's ratings of his

or her own behavioral responses (physical, social, cognitive, affective) are in line with some other objective standards (Dirette & Plaisier, 2007). Also, this construct has often been used interchangeably with the psychological term *insight*.

In the brain injury population, it is seen as an overall ability to recognize correctly those problems caused by brain impairments (Bach & David, 2006). Hence, it is the capacity to consciously process information related to oneself and to keep a reasonably objective understanding of one's own phenomenological experiences (Schretlen & Shapiro, 2003). Previous studies have found an association between insight and treatment outcomes (O'callaghan, Powell, & Oyebode, 2006; Dirette & Plaisier, 2007). Reportedly, individuals who report greater perceived control of their deficits in rehabilitation programs tend to have more successful outcomes in these settings (Fischer, Trexler, & Gauggel, 2004). They also have greater success in reintegrating into their communities, as evidenced by an ability to maintain long-term jobs (Bach & David, 2006; Ezrachi, Ben-Yishay, Kay, DiUer, & Rattok, 1991).

Impairments in insight are clinically relevant because they can hinder the capacity to establish rehabilitation goals and to anticipate and understand challenges that may be experienced in everyday living. Nevertheless, there is not a straightforward relationship between increased insight and better treatment outcomes. Self-awareness of deficits often brings increased emotional distress, and individuals often need to use problem-solving strategies to manage such distress (Dirette & Plaisier, 2007; Fischer et al., 2004). The goal for these patients would then be to learn how to deal with daily stressors by using coping skills that are most adaptive during their rehabilitation treatment (Smeets, Ponds, Verhey, & van Heugten, 2012;Medley et al., 2010).

Coping Styles in the Moderate to Severe Brain Injury Population

Generally, coping has been defined as an individual's cognitive and behavioral strategies for managing situations that have been appraised as stressful or demanding and might exceed the resources of the person. That is, coping is interpreted as the way in which a person deals with life events by tolerating, reducing, minimizing, or mastering such challenges (Wolters, Stapert, Brands, & Van Heugten, 2011). For individuals with brain injury, coping can be influenced by cognitive and interpersonal consequences of the head trauma. When accompanied by decreased perceived control, these individuals are more easily prone to use maladaptive coping styles, which can lead to a downhill spiraling into emotional instability (Rapoport, 2012; Bryant et al., 2000; Mooney & Speed, 2001; Mainio et al., 2007). For example, research has found that one of the main contributing factors to the presence of enduring post-injury emotional complaints in this population is their use of maladaptive coping styles (Velikonja et al., 2013; McNett, 1997).

An influential theory that has been utilized to understand differences in adjustment to health conditions, including cancer, chronic pain, and heart disease is the Lazarus and Folkman's theory of stress and coping (1984). This theoretical framework suggests that appraising a situation as controllable elicits an adaptive, problem-focused coping style. On the other hand, perceptions of uncontrollability elicit emotion-focused coping, which is a more maladaptive strategy (Lazarus, 1993; McNett, 1997).

Coping styles were initially divided into problem-focused and emotion-focused. Problem-focused coping strategies are used when an individual is actively seeking a solution of the problem by defining the problem. This has also been called *planful* coping

(Krpan, Anderson, & Stuss, 2013). When using this type of coping, the person is

constantly trying to address and confront the situation by changing it or by attempting to

obtain more information, resources, and skills (Shotton et al., 2007). It may include

defining the problem, generating alternative solutions, weighing the options, choosing

among all potential alternatives, and acting upon them (Lazarus & Folkman, 1984).

Emotion-focused style involves the management of stress through emotion,

frequently by avoiding the issue. This type of strategy has also been called *avoidant*

coping. When the individual engages in emotion-focused coping, he or she is actively

regulating the emotional reaction that the problem elicits rather than attempting to change

the stressful situation itself (Wolters et al., 2011).

Strategies can include distraction, suppression of feelings, thinking comforting

thoughts, avoidance, and expression of emotions. Emotion-focused coping does not refer

to dealing with stress by using emotional control. Instead, it refers to using coping skills

that address emotional reactions, and are less cognitive in nature, including sleeping,

wishful thinking, worrying, and ignoring the problem (Lazarus & Folkman, 1984). For

individuals living with brain injury, it has been suggested that emotion-focused strategies,

particularly denial, can be more adaptive during the acute phase following brain injury

(0-6 months post-injury), although these strategies are not useful in the long term.

Instead, problem-focused styles in the chronic phases (6 months and after injury) are

more suitable (Krpan, Levine, Stuss, & Dawson, 2007).

Emotion-focused coping strategies, such as emotional worry and escape avoidant

coping may increase in the first 6 months post brain injury, and such increase has been

linked to diminished productivity (Dawson, Cantanzaro, Firestone, Schwartz, & Stuss,

2006). In addition, other similar strategies such as self-blame, preoccupation, ignoring a problem, and keeping to oneself have been associated with increased stress, depression and anxiety in these patients. Because emotion-focused coping has been related to poor outcomes following brain injury in the post-acute phases, it is considered a maladaptive coping style (Krpan et al., 2007; Curran, Ponsford, & Crowe, 2000).

On the other hand, planful coping has been consistently linked to positive outcomes, and thus it is considered an adaptive coping strategy. Although this type of coping seems to be more useful in the long term, there is still very limited research on post-acute coping strategies. Hence, there is a great need to identify those specific patient characteristics that are associated with the use of adaptive coping styles in the long-term periods after brain injury. Although initial theoretical models proposed only two main coping styles (Lazarus & Folkman, 1984), this distinction has been described as oversimplified by other researchers (Carver, Scheier, & Weintraub, 1989; Endler & Parker, 1990). An avoidance factor has been identified as a very common, separate dimension (Amirkhan, 1990; Endler & Parker, 1994; Endler & Parker, 1999; Carver et al., 1989).

Whereas Lazarus and Folkman included avoidance as part of the emotion-focused style, others have described this as an independent construct, which involves more than simply ways to manage emotional reactions (Cook & Heppner, 1997). That is, individuals can engage in avoidance coping not only through cognitive responses such as denial and minimizing of the problem, but also through behavioral avoidance, by becoming involved in other activities as means of escape (Moos & Holahan, 2003).

Avoidance coping strategies involve active efforts to ignore or withdraw from the distressing situation and its associated emotions (Litman, 2006). This coping style has received strong support (Roth & Cohen, 1986; Endler & Parker, 1999), and has been identified as an independent coping style in several different coping instruments (Cook & Heppner, 1997; Carver et al., 1989; Endler & Parker, 1999; Brands, Köhler, Stapert, Wade, & van Heugten, 2014).

Hence, avoidance coping, including the use of denial and withdrawal are associated with maladaptive behaviors and psychological distress (Moos, & Holahan, 2003). Endler and Parker (1999), particularly, specified that individuals can engage in active avoidance coping either by getting away from the stressor or by engaging in other tasks (distraction) or by using other people as means to evade it (social diversion). Even though different researchers have proposed other coping styles (e.g. acceptance, seeking social support), the most common are: problem-focused, emotion-focused, and avoidance.

It has been unanimously suggested that problem-solving (task-oriented, problem-oriented, planful coping) is a more adaptive/positive approach and that predominant use of this coping style is associated with a better quality of life (Moos & Holahan, 2003; Wolters et al., 2011; Brands et al., 2014; Carver et al., 1989; Wolters, Stapert, Brands, & Van Heugten, 2010; Woods & Doughty, 2013).

A more clear understanding of the factors that influence the use of these coping styles may facilitate rehabilitation treatment (Wolters et al., 2011). Previous research has found patterns of relationships between coping and post brain injury outcomes; people who endorse less avoidant coping strategies and more problem-solving coping have

better psychosocial outcomes; those who indicate less planful and more avoidant coping have worse psychosocial sequelae and lower productivity (Krpan et al., 2013; Tomberg, Toomela, Pulver, & Tikk, 2005; Curran et al., 2000).

It is important to note that most of the research studies on coping styles have largely relied on self-assessment measures, without taking into consideration the level of self-awareness that the individual has regarding his cognitive deficits and without using other objective measures to complement self-reports. An over-reliance on self-assessments and a lack of objective measures to confirm the individual's reports can limit the validity of test results. Using assessments rated by professionals to measure treatment outcomes could potentially help minimize patient biases.

Although the literature supports an existing link between coping styles and psychosocial outcomes, there is more limited research on how different coping styles influence rehabilitation program outcomes (Wallesch et al., 2001; Wolters et al., 2011). These treatment outcomes can include levels of community involvement, the individual's ability to reach previously established goals, and level of participation in rehabilitation settings.

Stress-Appraisal-Coping Theoretical Model

Following the stress-appraisal theoretical framework of Lazarus and Folkman (1984), the stress-appraisal-coping (SAC) model was developed to conceptualize psychosocial adjustment in brain injury populations (Godfrey, Knight, Partridge, 1996). The SAC model hypothesizes that there are several mediating variables that can influence the severity of a patient's stress reactions by altering the impact of stressors. These mediators include the patient's insight into the magnitude of the demands he or she faces,

the ability to meet these demands through the use of coping strategies, and the extent to which he or she relies on social support (Godfrey et al., 1996).

In addition, self-perceptions of cognitive and/or physical symptoms influence the stress response. Therefore, according to the SAC model for brain injury patients, appraisals, social support, and coping skills will mediate the severity of stress responses. Previous research has investigated the impact of illness perceptions in neurological conditions, including multiple sclerosis, Huntington's disease, and epilepsy (Spain et al., 2007; O'callaghan et al., 2006; Herrmann et al., 2000). Collectively, these studies have found that diminished understanding of the illness, increased perceived stress, and beliefs about multiple symptoms are associated with poorer psychological, social, and physical functioning. That is, these factors are associated with increased depression and anxiety symptomology, decreased physical ability, and limited social interaction (Medley et al., 2010; Jorge & Arciniegas, 2014).

Recent research has provided some support for the applicability of the SAC model to understand emotional adjustment following mild brain injury. According to some findings (Shotton et al., 2007; McNett, 1997; Moore, Stambrook, & Peters, 1989), this model can be useful to better conceptualize these types of patients' cases. As emphasized by the SAC model, the level of adjustment will depend on mediating factors, including coping strategies, appraisal, and social support. Brain injury patients' perceptions of control over their lives and their capacities to cope efficiently with daily stressors will mediate the severity of their stress responses. This is important because it has been suggested that cognitive mediators and coping strategies are powerful determinants of

recovery (Godfrey et al., 1996).Therefore, stress and coping responses can impact an individual's psychosocial adjustment after the lesion, even several years later (Moos & Holahan, 2003).

According to the SAC model, assessment and interventions in a rehabilitation setting should concentrate on identifying and modifying mediators that influence the relationship between brain injury-related stressors and emotional adjustment (Godfrey et al., 1996). By understanding the individual's perceived stress and his or her coping strategies, researchers might understand the role of psychological processes in adjustment and develop techniques to facilitate successful treatment (Strom & Kosciulek, 2007). Although the model emphasizes only post-injury emotional adjustment, the present study will also focus on exploring how different coping styles can be predicted by cognitive functioning, community participation, and adjustment levels, as rated by a treatment team in a post-acute rehabilitation setting.

Summary and Critique of Literature

Numerous studies have been conducted on how specific coping styles can influence the progression of illness in medical populations. The literature, however, is much scarcer for the brain injury population. Although some studies have addressed how coping strategies can predict psychosocial adjustment following acquired brain injury (ABI), very few have been conducted in post-acute rehabilitation settings with moderate to severe brain injury patients. Because individuals with brain injury have more significant cognitive deficits, including limitations in insight and misperceptions in their functioning, understanding the relationship between coping and clinical treatment

outcomes can be a complicated task. Many studies have relied only on self-reports, which can lead to skewed results in individuals with more impaired awareness.

The present study examined the relationship between type of coping style and clinical outcomes, including mood and stress, adjustment and participation, and executive functioning ability, using both prospective data collection and an examination of archival records. Despite the current literature suggesting that task-oriented style is a more adaptive coping style because it has been correlated with better treatment outcomes in other medical populations, more research is needed with other medical patients, including individuals who have been living with moderate to severe brain injury for several years.

Chapter 3: Hypotheses

Objective I

To determine whether or not task-oriented coping styles and stress perceptions were associated with depressive symptoms in a brain injury population sample.

Hypothesis 1

It was hypothesized that lower levels of perceived stress (as measured by the PSS) and stronger reliance on task-oriented coping styles (as measured by the CISS) would predict fewer symptoms of depression (as measured by the PHQ-9).

Objective II

To determine whether or not social participation, adjustment, and executive functioning ability were predictive of task-oriented coping use and perceived stress levels.

Hypothesis 2

It was hypothesized that better adjustment and participation (as evidenced by lower scores obtained on the MPAI-4), and higher scores on measures of executive functioning (as measured by the NAB Judgment test) would predict a stronger reliance on task-oriented coping style (as measured by the CISS).

Hypothesis 3

It was hypothesized that better adjustment and participation (as evidenced by lower scores obtained on the MPAI-4), and higher scores on measures of executive functioning (as measured by the NAB Judgment test) would predict lower levels of perceived stress (as measured by the PSS).

Chapter 4: Method

Design

The study was conducted using multiple regression analyses. Data were obtained through self-report questionnaires that were administered to a brain injury population sample in two post-acute rehabilitation facilities. Additional data for the study were obtained through archival records that are collected annually for each individual. These archival records included neuropsychological test results and annual evaluations from the treatment team to rate each individual's level of adjustment and participation. Participants were assessed using measures of coping, stress, depression, a single area of executive functioning ability, and adjustment and participation. Demographic information was collected for all participants, including age, gender, guardianship status, years living with brain injury and treatment location. Institutional Review Board (IRB) approval was obtained from the Philadelphia College of Osteopathic Medicine and from a post-acute rehabilitation program prior to data collection.

Participants

The participants included individuals who were receiving services at a post-acute rehabilitation facility in New Jersey. All participants had a primary brain injury diagnosis and were enrolled in a day treatment program.

Inclusion Criteria:

The participants were required to meet predetermined conditions before being included in the study. First, individuals had to be receiving services at a post-acute rehabilitation program for at least six months. Second, they had to have existing

neuropsychological assessment and treatment records. Third, participants had to be a minimum of 18 years of age.

Exclusion Criteria

Exclusion criteria included those individuals who did not meet minimal scoring criteria on the Object Naming and Orientation sections of the Mini Mental Status Exam (MMSE). If subjects did not score at least 2/3 on Object Naming task and 5/10 for Orientation, they were deemed ineligible. This was used as a quick screen for aphasic and disorientation signs that would interfere with the ability to answer questions from self-reports. However, if participants spontaneously used an external compensatory strategy to answer questions correctly from the Orientation section, they still were eligible to participate.

Measures

Demographic Measure

Demographic information was obtained for all participants that included: age, gender, years living with brain injury, and legal guardianship status.

Coping Inventory for Stressful Situations (CISS).

The Coping Inventory for Stressful Situations is a self-report measure of coping that consists of 48 items. This is a prospective instrument that takes approximately 30 minutes to complete. The CISS is designed to assist in the evaluation of coping approaches that are utilized by individuals. There are 16 items assessing Task-Oriented coping, 16 items evaluating Emotion-Oriented coping, and 16 items assessing Avoidance-Oriented coping (Endler & Parker, 1999). These scales are derived from Lazarus & Folkman's Stress-Appraisal-Coping theory and from empirical bases.

The CISS is a multidimensional instrument that predicts preferred coping styles. To control for order effects, the items for the three major subscales are randomly distributed within the form. The items are rated on a 5-point frequency scale, ranging from 1 *(not at all)* to 5 *(very much).* Examples of items include "When encountering a difficult, stressful, or upsetting situation, indicate how much you engage in these types of activities: try to go to sleep; outline my priorities; buy myself something."

Task-Oriented coping style assesses purposeful, task-oriented efforts aimed at solving problems, cognitively restructuring the problem, or attempting to change the situation. That is, when faced with a stressful situation, the individual actively attempts to solve the problem. Emotion-Oriented coping describes emotional reactions to a stressful circumstance. These responses include emotional reactions (e.g. self-blame, anger, tension), self-preoccupation, and fantasizing (daydreaming reactions). The reaction is oriented towards the person, and can increase stress. Avoidance-Oriented coping style describes activities and cognitive changes intended to avoid the situation. This can occur by distraction or via social diversion (Endler & Parker, 1999).

The Perceived Stress Scale (PSS).

The Perceived Stress Scale is the most widely used psychological instrument to evaluate individual perceptions of stress. The PSS is a prospective tool that takes approximately 10 minutes to complete. It is a measure of the degree to which life situations are appraised as stressful. The items are designed to assess how unpredictable, uncontrollable, and overloaded the respondents find their lives, and it also includes a measure of current levels of experienced stress (Cohen, Kamarck, & Mermelstein, 1983). The questions are general in nature and relatively free of content specific to any

subpopulation group. The scale consists of 10 items, ranging from 0 (*never*) to 4 (*very often*). Representative items include "In the last month, how often have you felt that things were going your way?" and "How often have you been able to control irritations in your life?" High scores on the PSS have been associated with depressive symptoms triggered by stressful life events, failure to quit smoking, and greater difficulties in diabetic patients to control blood sugar levels (Cohen, Kamarck, & Mermelstein, 1994).

Patient Health Questionnaire - 9 (PHQ-9)

The Patient Health Questionnaire-9 is a 9-item self-report inventory designed to assess depression severity (Spitzer & Williams, 2001). The PHQ-9 is a tool that evaluates depression symptoms on a scale from 0 (*not at all)* to 3 (*nearly every day*). This prospective measure takes approximately 5 minutes to complete. Representative items include "Over the last two weeks, how often have you been bothered by little pleasure or interest in doing things?" and "Feeling down, depressed, or hopeless?" Studies have supported the reliability and validity of this measure in both medical and general population samples (Martin, Rief, Klaiberg, & Braehler, 2006).

Mayo-Portland Adaptability Inventory-4 (MPAI-4).

The Mayo-Portland Adaptability Inventory measures emotional adjustment and community participation. The MPAI-4 is designed to assist in the evaluation of people during the post-acute period following brain injury (Malec, 2005). MPAI-4 items represent physical, cognitive, emotional, social, and behavioral problems that an individual experiences after brain injury. Reportedly, concurrent and predictive validity of the MPAI-4 has been demonstrated in several studies because it correlates moderately well with the Disability Rating Scale, the Rancho Scale, and other neuropsychological

tests. Both person- and item-rater reliability are acceptable for the full scale and individual subscales, whereas inter-rater agreement within subscales can reflect some rater biases (Malec & Lezak, 2008).

Specifically, the two subscales that are areas of interest are: the Adjustment Index and the Participation Index. The Participation Index assesses the individual's ability to initiate tasks, to interact with people other than friends and family, to self-care, and to handle home responsibilities, employment status, finances, and transportation more independently. This scale consists of 9 items, ranging from 0 (*none*) to 4 (*severe problem*). Examples of items include, "Initiation: problems getting started on activities without prompting," and "Managing money and finances." Lower scores on this index would suggest that the individual is more definitely intact in the ability to manage these responsibilities; the higher the scores indicate that there are more limitations observed in these areas.

The Adjustment Index includes the measurement of anxiety, irritability, aggression, anger, depression, fatigue, pain/headache, and social contact. Representative items include, "Anxiety: tense, fearful, nervous, phobias, flashbacks of stressful events," and "Fatigue: feeling tired, lack of energy, tiring easily" (Bellon, Malec, & Kolakowsky-Hayner, 2012). The rehabilitation treatment team completes this evaluation every year, and it is used as an objective measure for each individual's progress within that year. Lower scores on this subscale reflect greater intact abilities, but higher scores evidence greater impairments. The MPAI-4 instrument is part of each individual's archival data. The subjects provided informed consent prior to reviewing these existing records.

Neuropsychological Assessment Battery (NAB) - Judgment Module.

The Neuropsychological Assessment Battery is an assessment tool that was developed to evaluate a wide array of cognitive functioning skills in adults, from ages 18 to 97 years with known or suspected neurological disorders (White & Stern, 2003). More specifically, the screening module is ideal for populations that cannot tolerate lengthier examinations, as in the case of more severely impaired individuals. The screening module measures five cognitive domains: attention, language, memory, spatial skills, and executive function.

Particularly, the area of interest is one of the many executive functioning tests of the NAB: the Judgment Module, which measures decisional capacity as it pertains to critical aspects of independence in daily living. It involves ten questions regarding home safety, health, and medical problems, which are likely to be encountered in daily life and require abstract reasoning and quick decision-making skills. This single test, however, provides only a glimpse of one aspect of these higher-order cognitive abilities. That is, as previously mentioned, executive functioning encompasses a series of intricate skills that are needed to self-regulate and self-direct behaviors, and a single test would not comprehensively assess all these areas.

This assessment, provided annually for every individual enrolled at the post-acute rehabilitation program, was part of the archival data records that were reviewed by the student researcher. The subjects provided informed consent prior to reviewing these existing records. Content validity and interrater reliability have been reported to be within acceptable limits (White & Stern, 2003).

Procedures

A sample of convenience was utilized to collect data; all participants were recruited from two of the centers of the post-acute rehabilitation setting. After obtaining IRB approval from the Philadelphia College of Osteopathic Medicine and from the post-acute rehabilitation program, all eligible individuals who were enrolled and were attending the day treatment program services at the time of the study were approached to discuss their potential participation.

Individuals were approached by the student researchers, who had valid certificates in the protection of human research participants, awarded by the National Institutes of Health (NIH) Office of Extramural Research. Persons getting treatment services were asked about their willingness to participate in the study, and were informed that this would require approximately 45-60 minutes of their time; those who chose to participate in the study had to answer a few screening questions (MMSE questions to determine orientation and comprehension), as well as to complete three self-reports (CISS, PSS, and PHQ-9).

They were also informed that the study required the researchers to review existing archival data, including each participant's neuropsychology test results (NAB) and treatment team review records (MPAI-4). Those individuals who expressed an interest in participating in the study were given screening questions and were provided with information about the nature and purpose of the study, including an explanation of the risks involved (See Appendix A). They were told that self-reports contained personal questions about their feelings, thoughts, behaviors, and practices. The student researchers assured potential subjects that participation was strictly voluntary and that their

involvement would not influence their ability to obtain future services from the program. Individuals learned that some questions could potentially cause mild distress and that they were free to withdraw from the study at any time without affecting their treatment.

Last, they were informed that their records would be kept confidential, unless they endorsed suicidality. In that event, a plan was created to determine the steps needed if a participant reported suicidal thoughts. Once the individual agreed to participate in the study, informed consent was obtained. If the individual had a legal guardian, the legal guardian was contacted by phone before approaching the potential subject. This same procedure was explained to legal guardians, and assent was obtained from each potential subject after legal guardians provided informed consent. All informed consents were kept in a separate folder, in a locked cabinet at the main center of the post-acute rehabilitation facility.

All participants filled out the measures with the assistance of a student researcher, who was present in the office with each subject to answer any questions or concerns during the administration of the self-assessments. If the participant had a physical disability that prevented him or her from reading the questions or from physically choosing an answer, the researcher provided support. This was in the form of: a) reading items from self-reports aloud, b) circling answers that participants selected.

After all prospective data were collected and archival test results were obtained, each subject's personal information was removed and test scores were transferred onto a spreadsheet, where data were de-identified to maintain anonymity and confidentiality. Informed consent records were kept in a locked cabinet in the neuropsychology

department office of the post-acute rehabilitation facility. Finally, de-identified data were

transferred into an SPSS file for analyses of three hypotheses.

Chapter 5: Results

For the present study, a list of potential participants was obtained, and individuals and their legal guardians (when applicable) were asked if they were willing to learn about the study. After completing a quick screen, using questions from the MMSE to determine their ability to understand content from informed consent or assent forms, 48 individuals were deemed eligible, having passed the predetermined MMSE criteria.

Only 34 individuals and 7 legal guardians provided informed consent. Legal wards (patients) were asked to provide assent after legal guardians signed informed consent. A total of 5 subjects provided assent, and 2 refused to participate. Those who agreed to participate were asked to complete PSS, CISS, and PHQ-9 self-report measures. However, only 32 participants were included in the final statistical analysis because 7 subjects who had missing archival records (NAB Judgment and/or MPAI-4 scores) were excluded.

Demographic Analysis

Overall, 15.6 % of the participants in the final sample were under legal guardianship and, initially, their guardians were contacted to discuss the study. Demographically, the full sample consisted of 71.9 % males (N= 23) and 28.1 % females (N= 9), with a mean age of 47.41 and an age range of 25 to 67. The sample consisted of 96.9 % Caucasian (N= 31) and 3.1 % Asian (N= 1) individuals, and except for a single participant, most individuals were of Non-Hispanic ethnicity (N=31, 96.9 %). On average, the number of years living with a brain injury was 22.03, with a range of 5 to 48 years. Data were collected at two different sites from a post-acute rehabilitation setting: 71.9 % of subjects were from the main center, and 28.1 % were from a second location.

Participation in this study was entirely voluntary and identifying information for

participants was removed for the purpose of maintaining confidentiality. See Table 1 for

more details of the demographic data analysis.

Table 1

Demographic Analysis

	N	Range	Min	Max	Mean	Std. Dev
Age	32	42	25	67	47.41	10.379
Years living with Brain Injury	32	43	5	48	22.03	11.996

		Frequency	Percent
Treatment Location			
	A	23	71.9
	B	9	28.1
	Total	32	100.0
Guardian Y/N			
	No	27	84.4
	Yes	5	15.6
	Total	32	100.0
Gender			
	Male	23	71.9
	Female	9	28.1
	Total	32	100.0
Race			
	Caucasian	31	96.9
	Asian	1	3.1
Ethnicity			
	Hispanic	1	3.1
	Non-Hispanic	31	96.9

The goals of the present study were: 1) to determine whether the use of a specific coping style and stress levels (using subjective measures) were associated with depression symptoms in a brain injury population, and 2) to determine whether or not adjustment, participation, and executive functioning ability (using objective measures) predicted stress levels and the use of task-oriented coping in a brain injury population sample. Three hypotheses were tested, using linear multiple regression analyses to evaluate these relationships. All statistical analyses were computed using the Statistical Package for Social Sciences Program (SPSS), Version 23.

Descriptive statistics were obtained to examine the mean and standard deviations for reported symptoms of depression, stress, type of coping style used to deal with daily challenges, participation and adjustment, and executive functioning skill in individuals with brain injury. On average, participants from this sample endorsed mild levels of depression (mean= 6.44) and low levels of stress (mean= 12.72). In terms of coping styles, they reported using average levels of avoidance, when compared with the normative sample (mean T score= 53, 62nd percentile), as well as using average levels of emotion-oriented coping (mean T score= 48, 42nd percentile). Hence, they endorsed using similar numbers of behaviors classified as avoidance and emotional reactions to stress, which fall in the average range.

These include using distractions involving other situations or tasks, social diversions, and reliance on emotional responses, such as self-blame, anger and anxious thoughts and feelings, self-preoccupation, and fantasizing as ways to alleviate stress. Both emotion-oriented and avoidance coping ranged from very much below average to very much above average use (Emotion-oriented min T score =2, max T score= 72;

Avoidance min T score = 32, max T score= 75).

Overall, on average, the sample endorsed using below average levels of task-oriented coping (mean T score= 42, 21st percentile), making it the least endorsed coping style of these three types. Therefore, they reported using less purposeful efforts to solve problems or attempts to alter existing situations when compared with the normative sample of adults. Furthermore, on average, treatment team ratings for MPAI-4 Adjustment (mean T score= 49.18) and Participation (mean T score= 49.03) reflected moderate severity of impairments in these areas, ranging from mild to severe limitations. That is, the sample, overall, showed moderate levels of deficits, even when compared with other brain injury populations. When examining a single area of executive functioning ability using the NAB Judgment Test, the mean performance on this test for this population sample fell in the average range (mean T score= 47.93), ranging from severely impaired (T score= 19) to superior (T score= 72). See Table 2 for a summary.

Table 2

Descriptive Statistics for Self-Report Measures

	Mean	Std. Dev	Min	Max
PSS	12.72	8.27		
PHQ-9	6.44	4.80		
CISS-Task Oriented	42.59	11.33	25	63
CISS-Emotion	48.68	13.19	29	72
CISS-Avoidance	53.63	12.34	32	75
NAB- Judgment	47.93	15.29	19	72
MPAI-4 Adjustment	49.18	6.47	38	67
MPAI-4 Participation	49.03	5.94	40	69

Linear multiple regression analyses were conducted. For each hypothesis, there

was more than one predictor (independent) variable to predict a single criterion

(dependent) variable. The purpose was to find the linear combination of multiple

predictors that correlate maximally with the outcome variables (Field, 2009). The

ENTER method was used because predictor variables were entered simultaneously, in a

single step. When a regression is completed in this manner, an equation is produced that

is appropriate for the sample of observed values. For these regression models to

generalize, underlying assumptions had to be met. As such, in accordance with Field

(2009), the following assumptions were true about the variables tested: all predictor

variables were quantitative or categorical and the outcome variable was also quantitative,

continuous, and unbounded.

Regression also assumes that the predictors have some variation in value and do

not have a variance of zero. There should not be a strong linear relationship between two

or more of the predictors, which is known as no perfect multicollinearity assumption

(Field, 2009). Values of Tolerance statistics measure multicollinearity, and particular

concerns arise when these are below .10. All of the Tolerance values for this study were

above this cutoff number, which indicates there were no problems with multicollinearity.

When examining the Variance Inflation Factor (VIF), which also provides information on

whether or not a predictor has a strong relationship with other predictors, further evidence

was found to conclude that multicollinearity was not a problem because all values were

less than 10.

Furthermore, an examination of the histograms of standardized residuals showed

that the data contained approximately normally distributed residuals, evidencing that the

assumption of normality was met. Similarly, the Normal Probability Plot of regression, which examined observed cumulative percentages to expected cumulative percentages, provided further evidence for the assumption of normality because it showed that the points were almost all completely or near the line. The scatterplots of standardized residuals showed that the data met the assumptions of homogeneity of variance. Therefore, based on these results, it was concluded that the assumptions of regression were met.

Hypothesis I

The first hypothesis of the study examined whether or not two predictor (Independent Variables= IV), continuous variables (task-oriented coping and perceived stress) predicted one criterion (Dependent Variable= DV) variable (depression symptoms). A linear multiple regression was conducted using the ENTER method, in which Coping Style subscale (task-oriented) and Stress Perception were the IVs, and Depression Levels was the DV. No outliers were found that needed to be removed from the analysis (Std. Residual Minimum = -1.613, Maximum= 2.181).

The assumption of no perfect multicollinearity was met (Tolerance = .901, VIF= 1.110). When analyzing the histograms of standardized residuals, the data contained approximately normally distributed residuals, and the Normal P-P Plot of Regression data points were all around the line, indicating that the assumption of normality was met. The Durbin-Watson value tests for serial correlations between errors in regression models (Field, 2009). After evaluating this value, it was determined that the assumption of independent errors was met (Durbin-Watson= 1.588). There were no outliers that needed to be removed from the analysis (Std. Residual Minimum = -1.613, Maximum= 2.181).

As shown in Table 3, the results of this multiple linear regression indicated a multiple correlation of R= .727 with a coefficient of determination of .529 (R^2= .529), which means that approximately 52.9 % of the variance observed can be attributed to a combination of two predictor variables: task-oriented coping style and perceived stress. If the population had been assessed, the adjusted coefficient of determination suggests that there would be a reduction from sample to population in the observed variance (*Adjusted* R^2 = .497).

Overall, the regression analysis, as shown in Table 4, evidenced a significant effect of task-oriented coping style and perceived stress levels on depression symptoms F (2, 29)= 16.298, $p =$ .000. An examination of the predictor variables indicated that perceived stress was positively related to the prediction of depression symptoms, but the use of task-oriented coping style was negatively related to the prediction of depression. That is, the results suggest that individuals with higher levels of perceived stress experience more depression symptoms (β= .507, p = .001), and those who use more task-oriented coping experience less depression symptoms (β= -.386, $p < .05$). The analysis of beta coefficient is shown in Table 5.

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Table 5

Multiple Regression Beta Coefficients with Depression as the Criterion.

	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	9.662	2.957		3.268	.003		
Perceived Stress	.295	.078	.507	3.778	.001	.901	1.110
Task-Oriented Coping	-.164	.057	-.386	-2.875	.007	.901	1.110

a. Dependent Variable: PHQ-9

Hypothesis II

For the second hypothesis, a separate multiple linear regression was conducted using the ENTER method to determine whether or not three predictor (continuous) variables (participation, adjustment, and executive functioning ability) would predict one criterion variable (task-oriented coping style). No outliers were found that needed to be removed from the analysis (Std. Residual Minimum = -1.817, Maximum= 1.490).

It was concluded that the assumption of normality was met because the histograms of standardized residuals showed the data contained approximately normally distributed residuals, and the Normal P-P Plot of Regression data points were all around the line. Moreover, the assumptions of independent errors (Durbin-Watson= 1.843), and no perfect multicollinearity were met (See Table 8 for Tolerance and VIF values).

The results of this analysis revealed that there were no significant effects of social participation, adjustment, and executive functioning ability on task-oriented coping $F_{(3, 28)}$= .736, p > .05, R^2 = .073, R^2 *adjusted*= -.026. That is, as shown in Tables 6 and 7,

none of these independent variables predicted the use of task-oriented coping. See Table

6 for more details.

Table 6

Model 1 Summary for Hypothesis II

Model	R	R^2	Adjusted R^2	Std. Error of Est.	R^2 Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.270[a]	.073	-.026	11.475	.073	.736	3	28	.540	1.843

a. Dependent Variable: CISS Task-oriented Coping

b. Predictors: (Constant), MPAI-4 Participation, MPAI-4 Adjustment, and NAB Judgment

Table 7

Overall Results of Multiple Regression Analysis with Predictor Variables (Participation, Adjustment, and Judgment) and the Dependent Variable of Task-oriented Coping.

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	290.594	3	96.865	.736	.540[b]
Residual	3687.125	28	131.683		
Total	3977.719	31			

a. Dependent Variable: CISS Task-oriented Coping

b. Predictors: (Constant), MPAI-4 Participation, MPAI-4 Adjustment, and NAB Judgment

Table 8

Multiple Regression Beta Coefficients for Predictor Variables (MPAI 4 Participation, MPAI 4 Adjustment, and NAB Judgment) with Task-oriented Coping as the Criterion.

	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	56.585	21.506		2.631	.014		
Participation	-.036	.418	-.019	-.086	.932	.688	1.453
Adjustment	-.368	.371	-.210	-.990	.330	.737	1.356
Judgment	.122	.143	.165	.854	.400	.887	1.128

    a.   Dependent Variable: CISS Task-oriented Coping

Hypothesis III

In order to determine whether or not three predictor (continuous) variables (MPAI-4 participation, MPAI-4 adjustment, and NAB-executive functioning ability) would predict one criterion variable (PSS- perceived stress), a multiple linear regression was conducted, using the ENTER method to add all predictors at the same time, without a particular order. There were no outliers that needed to be removed from the analysis (Std. Residual Minimum = -2.203, Maximum= 1.947). The results of this analysis revealed that neither MPAI-4 Participation nor NAB- Judgment predicted PSS- Perceived Stress levels in individuals living with a brain injury.

However, it was found that MPAI-4 Adjustment did make a significant contribution to PSS- Perceived Stress scores. The assumption of no perfect multicollinearity was met (See Table 11 for Tolerance and VIF values). When analyzing the histograms of standardized residuals, the data contained approximately normally distributed residuals, and the Normal P-P Plot of Regression data points were all around

the line, indicating that the assumption of normality was met. In addition, as shown in

Table 9, the Durbin-Watson value indicated that the assumption of independent errors

was met (Durbin-Watson= 1.741).

Table 9 shows the results of this linear multiple regression, which revealed a

multiple correlation of R= .555 with a coefficient of determination of .308 (R^2= .308),

which means that approximately 30.8 % of the variance observed can be attributed to two

predictor variables: participation and adjustment. If the population had been assessed, the

adjusted coefficient of determination suggests that there would be shrinkage from sample

to population in the observed variance (*Adjusted* R^2 = .234).

Overall, the regression analysis, as shown in Table 10, evidenced a significant

effect of participation and adjustment on perceived stress levels F (3, 28) = 4.158, *p* <

.05. An examination of the predictor variables indicated that MPAI-4 Adjustment was

positively correlated to the prediction of perceived stress levels symptoms. High scores

on the MPAI-4 Adjustment subscale evidenced greater impairment in mood, energy, and

self-awareness, as well as more limitations in social interactions and recreational

activities. High scores on the PSS reflect increased levels of perceived stress and

decreased sense of control and confidence in the ability to handle unexpected life

situations. As such, there was a relationship between greater impairment in adjustment

and more perceived stress. Consistent with these results, individuals with lower scores on

the MPAI-4 Adjustment subscale (and therefore showing better overall adjustment),

reported less PSS- Perceived Stress (β= .631, *p* <. 05).

On the other hand, MPAI-4 Participation was negatively correlated with the

prediction of perceived stress symptoms (β= -.452, *p* <. 05). Higher scores on the

Participation index indicate more severe limitations in the ability to initiate social contact and leisure activities, in self-care, and deficits in the management of home, finances, medication, work, and transportation. Therefore, those who were not actively involved in these activities (because they had greater impairment) also endorsed lower levels of perceived stress. Similarly, those participants with lower scores in the MPAI-4 Participation subscale (and therefore showing better ability to participate in activities and social interactions, and more control over life responsibilities), reported higher levels of perceived stress. The analysis of beta coefficients is shown in Table 11.

Table 9

Model 1 Summary for Hypothesis III

Model	R	R^2	Adjusted R^2	Std. Error of Est.	R^2 Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.555[a]	.308	.234	7.234	.234	4.158	3	28	.015[b]	1.741

a. Dependent Variable: PSS
b. Predictors: (Constant), MPAI-4 Participation, MPAI-4 Adjustment, and NAB Judgment

Table 10

Overall Regression Analysis with Predictor Variables (Participation, Adjustment, and Judgment) to the Dependent Variable (Perceived Stress).

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	652.930	3	217.643	4.158	.015[b]
Residual	1465.539	28	52.341		
Total	2118.469	31			

a. Dependent Variable: PSS

b. Predictors: (Constant), MPAI-4 Participation, MPAI-4 Adjustment, and NAB Judgment

Table 11

Multiple Regression Beta Coefficients for Predictor Variables (MPAI 4 Participation, MPAI 4 Adjustment, and NAB Judgment) with Perceived Stress as the Criterion.

	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	9.079	13.558		.670	.509		
Participation	-.629	.264	-.452	-2.385	.024	.688	1.453
Adjustment	.806	.234	.631	3.445	.002	.737	1.356
Judgment	-.108	.090	-.199	-1.193	.243	.887	1.128

a. Dependent Variable: PSS

b. Predictors: (Constant), MPAI-4 Participation, MPAI-4 Adjustment, and NAB Judgment

Additional Analyses

Finally, an additional multiple regression analysis was conducted to determine whether or not there was a relationship between type of coping style and years since brain injury. In order to determine if any of the three coping styles (task-oriented, avoidance, and emotion-oriented) would be correlated to time since brain injury, the ENTER method was used. There were no outliers that needed to be removed from the analysis (Std. Residual Minimum = -1.429, Maximum= 2.166).

When examining the histograms of standardized residuals, the data contained approximately normally distributed residuals, and the Normal P-P Plot of Regression data points were all around the line. Therefore, the assumption of normality was met. It was also concluded that the assumption of independent errors was also met (Durbin-Watson= 2.052), and there was no perfect multicollinearity (See Table 12 for Tolerance and VIF values).

The results of this analysis revealed that there were no significant relationship between task-oriented coping, avoidance, and emotion-oriented coping on years living with brain injury: $F (3, 28) = .080$, $p > .05$, $R^2 = .008$, R^2 *adjusted*= -.098. That is, as shown in Tables 13 and 14, none of these independent variables predicted the time living with brain injury. According to the results, there were no significant findings that predicted a specific type of coping style used, based on time living with brain injury.

Table 12

Model 1 Summary Table.

Model	R	R^2	Adjusted R^2	Std. Error of Est.	R^2 Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.092[a]	.008	-.098	12.568	-.098	.080	3	28	.970[b]	2.052

a. Dependent Variable: Years Living with Brain Injury

b. Predictors: (Constant), Task-Oriented, Avoidance, Emotion-Oriented Coping

Table 13

Overall Results of Regression Analysis with Predictor Variables (Task-Oriented, Avoidance, Emotion-Oriented Coping) and the Dependent Variable of Years Living with Brain Injury.

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	37.900	3	12.663	.080	.970[b]
Residual	4423.068	28	157.967		
Total	4460.969	31			

a. Dependent Variable: Years Living with Brain Injury

b. Predictors: (Constant), Task-Oriented, Avoidance, Emotion-Oriented Coping

Table 14

Multiple Regression Beta Coefficients for Predictor Variables (Task-Oriented, Avoidance and Emotion-Oriented Coping) with Years Living with Brain Injury as the Criterion.

	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1 (Constant)	27.544	12.597		2.187	.037		
Task-O	.004	.247	.004	.017	.986	.653	1.531
Emotion-O	-.049	.181	-.054	-.270	.789	.894	1.118
Avoidance	-.062	.235	-.064	-.263	.795	.606	1.650

a. Dependent Variable: Years Living with Brain Injury

Chapter 6: Discussion

One of the goals of this study was to evaluate whether or not a specific coping style and perceived stress levels predicted depressive symptoms for individuals in a post-acute rehabilitation setting. Because research has suggested that stress appraisals and adaptive coping strategies can predict emotional adjustment post brain injury (Krpan et al., 2007), it was expected that reported use of problem-solving strategies and lower levels of perceived stress would predict fewer symptoms of depression.

Previous literature has deemed problem-focused strategies as "adaptive" coping, and it has been suggested that using "maladaptive" coping styles, such as avoidant and emotion-focused coping lead to higher levels of depression (Curran, Ponsford, & Crowe, 2000). For this study, it was expected that task-oriented coping style would evidence a more adaptive way of dealing with daily challenging situations for brain injury patients, which would correlate with less stress and depression levels in these patients.

Similarly, another goal was to evaluate whether or not social participation, adjustment, and executive function ability, as rated by the treatment team in a rehabilitation setting, predicted the use of a task-oriented coping style. Task-oriented coping requires active problem solving, which involves skills mediated by the frontal lobe of the brain (Blumenfeld, 2010). Hence, it was expected that individuals with higher scores in a measure of executive functioning ability would also utilize more task-oriented coping. Furthermore, if task-oriented coping is indeed a more adaptive way of dealing with life challenges, then it was hypothesized that those individuals who reported using these approaches more frequently would also score lower in anxiety, irritability, inappropriate social interactions, and worries about brain injury related symptoms.

Therefore, they were predicted to have lower scores on the Adjustment Index of the MPAI-4, as rated unanimously by professionals who know the patient.

It was also hypothesized that patients with brain injury who reported greater use of task-oriented coping would have lower scores on areas measuring an individual's problems initiating and participating in leisure and other activities, completing ADLs and IADLs, using transportation independently, engaging in employment or volunteering, and managing money and finances.

That is, they were expected to score lower on the Participation Index of the MPAI-4, which would evidence more independence in the previously mentioned domains. These hypotheses were evaluated through prospective data collection (using PHQ-9, CISS, and PSS self-report measures), and review of archival data, including neuropsychological test results (NAB-Judgment scale) and ratings made by staff members regarding each participant's level of social participation and adjustment (MPAI-4 Participation and Adjustment scales).

A review of the literature showed that many studies had previously relied mainly on self-reports from patients, which is not always ideal, given that some of these patients can have deficits in insight and underreport or over report symptoms (Fischer et al., 2004; O'Callaghan et al., 2006). Although this study collected self-reported measures of mood, stress, and coping styles, it also used objective instruments rated by treatment team professionals; in addition, executive functioning measures were administered and interpreted by psychology staff members to provide a more comprehensive, and less biased picture of the level of functioning of each patient.

This exploratory study is also unique because to this date, there has been a scarcity of similar research projects in post-acute rehabilitation settings, working with individuals who are living with more severe brain injuries.

Significant Findings and Clinical Implications

Coping and Perceived Stress Effects on Depression. It was hypothesized that lower levels of perceived stress (as measured by the PSS) and more reported use of task-oriented coping style (as measured by the CISS) would predict lower depression scores (as measured by the PHQ-9). As predicted, the current study found that perceived stress was positively correlated with depression symptoms. Therefore, higher levels of perceived stress were associated with more depression symptoms, and lower levels of perceived stress were associated with fewer depression symptoms. Conceptually, it would make sense that those who felt on top of things, who were confident about their ability to handle problems, who were able to overcome difficulties, and who were in charge of the important things in their lives were less likely to endorse feelings of hopelessness, sadness, anhedonia, fatigue, and/or troubles with concentration.

The present study also found that the use of task-oriented coping was negatively correlated with depression. That is, the more task-oriented coping strategies (problem solving) that participants reported using, the fewer feelings of depressions that were endorsed. Similarly, less use of task-oriented coping was correlated with higher scores on depression measures. Prior research has found that lack of perceived control over life challenges is often accompanied by the use of maladaptive coping, which can result in emotional instability (Mooney & Speed, 2001; Mainio et al., 2007).

Consistent with these findings, it can be inferred that an increased sense of control over daily struggles can lead to stronger reliance on adaptive coping strategies, and thereby, improvements in emotional states. Hence, those individuals who believe that they have the ability to monitor and regulate a variety of situations in their lives may be less prone to use avoidance or emotion-oriented coping because they feel more capable of confronting these events instead of using denial or of focusing on the emotional aspects.

Although it is important to note that these results relied heavily on self-reports and perceptions from participants, as opposed to impartial observations of the strategies that they truly use to manage daily problems, it appears that having a sense of control over life problems contributed to their lower stress and depression symptoms. Consistently, on average, this sample endorsed only mild levels of depression and lower perceived stress. Although it may be difficult to determine if these participants indeed use more problem-solving strategies to manage their daily struggles, it can be argued that just by having the perception that they, in fact, do engage in task-oriented coping can serve as a protective factor against depression and stress.

Another important distinction to make is the fact that this is a sample of moderate to severe brain injury survivors in the chronic phases of their recovery because the mean number of years living with a brain injury for participants was 22, ranging from 5 to 48 years. From this sample, those participants who reported more task-oriented coping (and hence reported higher use of problem-solving strategies) also endorsed less depression and stress. Therefore, individuals who see their main coping styles as task-oriented appear also to have a higher sense of control, as well as less stress and fewer depressive symptoms. This relationship, however, was not related to the amount of time living with

a brain injury because all participants were in the chronic stages of recovery, and some of these did report using more avoidance and emotion-oriented coping than task-oriented coping.

For those who did endorse higher reliance on task-oriented coping, it is possible that after living with a brain injury for long periods of time, they have become accustomed to their conditions and have developed a sense of stability and control, when compared with those in the acute phases of recovery. Over time, they may have either developed a stronger understanding and higher implementation of problem-solving skills needed to manage daily challenges, or have established a sense of resilience, which in turn amplified reports of task-oriented coping.

In contrast, previous research suggests that those living in the acute stages use more avoidance and emotion-focused coping (Dawson et al., 2006; Mooney & Speed, 2001); these skills are initially more adaptive because they help adjust to life changing events that occur shortly after suffering a traumatic experience, such as a serious brain injury. Thus, sleeping, wishful thinking, and ignoring the problem may initially serve an adaptive function, but it becomes ineffective during the more chronic stages of recovery because it requires active participation from the individual to acclimate to a different lifestyle. The present study did not find a relationship between time living with a brain injury and type of coping style, possibly due to the fact that all these individuals are already in chronic recovery phases.

Adjustment, Participation, and Executive Functioning Ability Effects. Results from the current study showed that the contribution of all the independent variables (i.e. social participation, adjustment, and executive functioning ability) did not predict the use

of greater task-oriented coping. It was hypothesized that task-oriented coping would be

predicted from increased executive functioning ability (as demonstrated by higher scores

on the NAB-Judgment scale), and better social participation and adjustment (as shown by

lower scores on these subscales of the MPAI-4) because this type of coping has been

previously characterized as more adaptive (Krpan et al., 2013).

Task-oriented coping requires continuous attempts to confront and address the

situation by modifying it or trying to get information and resources that would lead to

solutions. Therefore, it was expected that participants with more intact scores on the

MPAI-4 Adjustment and Participation scales would report using more task-oriented

coping because engaging in problem solving requires higher levels of emotional stability,

appropriate social interactions with others, active initiation of and involvement in

activities, ability to independently complete ADLs, and efficient use of resources.

Furthermore, problem-solving skills involve defining a problem, generating

possible solutions, weighing pros and cons, choosing the best alternative, and acting upon

it (Shotton et al., 2007). Because these are executive functioning abilities that require

higher-order thinking processes, they were expected to correlate positively with higher

scores on the NAB Judgment Test. Nevertheless, only an individual measure of executive

functioning skill was used for this study, as opposed to a more comprehensive evaluation

of this cognitive domain.

Thus, a single subtest may simply not be sufficiently powerful to produce an

effect on task-oriented coping. Moreover, the NAB Judgment Test evaluates only a small

part of the executive functioning domain, and it is largely verbally mediated, which may

be a disadvantage for those individuals with language-related problems. As a result, a more comprehensive battery was needed to obtain a more accurate depiction of executive functioning skills.

On the other hand, it is possible that the present study did not find significant correlations in these areas because individuals are not necessarily utilizing task-oriented coping, but rather have biased opinions that they do. This would result in an over reporting of this coping style by individuals with limited insight, leading to a misrepresentation of task-oriented scores on the CISS measure and of perceived control on the PSS instrument.

Similarly, there were no significant effects of social participation and executive functioning ability on perceived stress. A correlation was predicted, with higher scores on executive functioning skill and lower scores on the MPAI-4 Participation Index (evidencing more intact abilities on this area) suggesting lower perceived stress scores on the PSS instrument. Because the treatment professionals completed the NAB Judgment Test independently, a more accurate representation of a single area of executive functioning for these subjects was provided, which yielded no significant relationship between executive functioning ability and task-oriented coping. In other words, because trained professionals rate the NAB Judgment Test, the probability of obtaining inflated reports of patients' skills in the previously mentioned cognitive domain is significantly reduced.

On the other hand, results revealed that MPAI-4 Adjustment and Participation did make a significant contribution to the prediction of PSS Perceived Stress. The present study found that adjustment was positively correlated to perceived stress. In other words,

high scores on the MPAI-4 Adjustment Index scale (evidencing greater impairment) predicted higher levels of perceived stress. Likewise, low scores on the MPAI-4 Adjustment Index scale (suggesting less impairment) were significantly correlated to low levels of perceived stress. The MPAI-4 Adjustment Scale measures observed irritability, anxiety, anger, depression, fatigue, self-awareness, ruminative thought patterns about the brain injury, and social interactions with friends, family, and professionals. Even though the treatment team rated these measures, it would make sense that those individuals who reported feeling in control of life situations and being confident about their ability to handle unpredictable events would show more emotional stability. That is, if they endorsed lower levels of perceived stress, they would be less likely to appear sad, irritable, angry, or isolative on observation.

Surprisingly, MPAI-4 Participation was negatively correlated to the prediction of PSS Perceived Stress symptoms. That is, participants with higher scores on the MPAI-4 Participation Subscale (and therefore showing greater impairment in this area), as rated by their treatment team, reported lower PSS- Perceived Stress. Correspondingly, those who scored lower on the MPAI-4 Participation Subscale (evidencing better ability to initiate activities, having more social involvement with others, requiring minimal assistance managing home and finance responsibilities, using transportation more independently, and having a social role, such as a job or volunteer work) endorsed higher levels of PSS Perceived Stress.

This association is likely because those individuals who have higher capacities to get involved in job responsibilities, be in charge of managing finances and other home duties, and who are able to partake actively in social relationships may feel more

pressured and overwhelmed by these activities, as well as by expectations from themselves and others to succeed. Similarly, individuals who have less impairment may potentially also have more self-awareness, and thus, an increased ability to describe their levels of stress more accurately.

Last, there were no significant findings that predicted a specific type of coping style used by the participants based on time living with brain injury. Because problem-solving skills and task-oriented coping have been deemed more adaptive during the chronic stages, post-brain injury, an exploratory question of the present study was to determine if specific types of coping style were related to years living with a brain injury. That is, it was expected that those individuals with fewer years of living with a brain injury would endorse more emotion-oriented and avoidance coping. Likewise, in congruence with existing literature, it was anticipated that those participants with the higher number of years living with a brain injury would report using more task-oriented coping. However, it is possible that insight, cognitive functioning, time in which the brain injury was acquired, and many other factors that were not accounted for in this study mediated these relationships.

Limitations

This study included several inherent limitations. First, the sample size for the study was limited to a convenience sample from a post-acute rehabilitation setting. Because brain injuries are highly heterogeneous, the number of predictor variables included in the analysis of emotional adjustment for a post-acute brain injury population was limited. Additional predictive factors that were not included likely influence emotional adjustment, including comorbid psychiatric diagnoses, substance abuse issues, neurological sequelae, medical conditions, sexuality problems, loss of independence, and others.

Although a brief measure of orientation and language skills was provided to exclude individuals with severe impairments in language and orientation, this study did not control for variability in cognitive functioning. Namely, other impairments in cognition likely impacted, to some extent, the responses provided by participants, including problems in memory, attention and concentration, expressive and receptive language, and awareness, among others. As a result, the cognitive status of participants can vary greatly from one another, and thereby, impact performance on tests, as well as the ability to complete self-report measures accurately.

Another limitation of this study was the use of self-reported measures to assess coping styles, depression, and stress appraisals. It is possible that some individuals who had decreased self-awareness may also have a skewed understanding of the type of coping strategies they utilize when dealing with daily stressors. If they are not mindful of the type of coping skills that they typically engage in, they may incorrectly endorse certain styles that are not truly representative of the way in which they usually cope.

Similarly, the study relied on the participants' ability to remember thoughts, behaviors, and feelings experienced within a certain time frame, and these reports likely were skewed by memory deficits. Comprehension of the questions was also required in order to answer self-report items, and therefore, individuals with more subtle receptive language problems were more likely to struggle with these questionnaires. Moreover, even though objective measures of adjustment and social participation were used, clinicians and providers may have also been biased when rating these scales. Assessments may have been influenced by the type of environment in which participants were observed (e.g., group home versus day treatment program settings, time of the day, etc.); the strength of the therapeutic relationship with staff members (for example, clinicians typically spend more time discussing patient emotions and behaviors than speech therapists); the focus of therapy (for instance, patients may present as "moody" or "resistant" if they have to engage in uncomfortable physical therapy exercises); the prior number of interactions with patients, and any preconceived notions of individuals, based on past interactions.

In addition, having a predominantly male sample may have also skewed these results because societal norms can often influence the ways in which males and females express emotions. Also, because this is a convenience sample, the results are relevant to this specific post-acute rehabilitation setting, and may not be generalizable to other organizations that provide services to individuals with brain injuries. Hence, having a predominantly male sample population of middle-aged individuals who are living in the chronic stages of recovery following brain injury would not make these results

generalizable to other populations, such as those individuals in acute brain injury facilities, or in other programs with more gender and age heterogeneity.

Further, as previously mentioned, this population sample endorsed fewer depression and perceived stress symptoms on average, which suggests that their adaptations to their life circumstances is better established. That is, they seem to be more accustomed to at least some of the limitations related to their brain injuries. Also, those who reported using more task-oriented coping rather than avoidance or emotion-focused coping also endorsed having a stronger sense of control over their lives. Consequently, it is difficult to determine whether or not these individuals actually use more task-oriented coping or simply report using more of these strategies. Many other factors that contribute to each individual's emotional adjustment and social participation, including the fact that unique physical, cognitive, and emotional influences were not taken into account for this study. Some of these include premorbid levels of functioning and use of coping skills, comorbid psychiatric conditions, awareness, support systems, quality of life, and previous treatments. Last, controlling for variability in cognitive functioning will likely help determine the validity of self-report answers in future studies. For the present study, participants represented different cognitive functioning abilities across domains, including impaired, borderline, average, and above average ranges.

Implications and Future Directions

Although this was a convenience sample, the study may be beneficial to a post-acute rehabilitation setting by identifying coping strategies associated with better treatment outcomes (lower levels of depression, higher social participation). This

information can be utilized to develop services aimed at improving emotional adjustment

and social participation in individuals with moderate to severe brain injury in post-acute

rehabilitation settings.

On one hand, this information can be utilized to develop treatment interventions

(i.e., group and individual therapy) that directly target the learning and application of

problem solving strategies (task-oriented coping). This can be done by designing

common scenarios of daily challenges that brain injury patients in post-acute settings

experience; this includes teaching how to generate realistic solutions, to consider the pros

and cons of all available options, and to choose and implement the best solution to a

specified situation.

Additionally, the program can teach the differences in task-oriented, emotion-

oriented, and avoidance coping strategies, and the effectiveness of each of these in

different circumstances. For instance, sometimes it can be useful to use denial and

distraction if a given problem is too overwhelming and there are no solutions available, in

order to reduce these feelings of being overwhelmed. This would also allow individuals

to use the skills that are most adaptive for a given situation.

On the other hand, because there may be a possibility that individuals *reported*

using task-oriented coping, as opposed to *truly using* this coping style, it would be

beneficial to develop treatment interventions that aim to increase their sense of control

and resilience because having self-views of being in charge and being able to problem

solve appear to help experience fewer depression and stress symptoms. This can be done

by focusing on the aspects of their lives that are malleable (e.g., improving relationships,

getting a job, finding a romantic partner, nurturing friendships, decorating their homes,

etc.), and encouraging behavioral change in a variety of settings, which could increase autonomy and strengthen their sense of control.

In addition, the study of coping styles has been an area of interest in treating other medical patients, but it has not been largely researched in post-acute brain injury patients. If individuals with brain injuries can be taught coping strategies to deal with life challenges early in their recovery process, this could potentially help them adjust better to their lifestyles, post brain injury. They can also be empowered and thereby prevent serious long-term emotional repercussions.

Future studies should focus on evaluating coping styles and stress perceptions at different time points in their recovery processes, across different settings, with more heterogeneous and larger sample sizes. It would also be interesting to evaluate emotional adjustments before and after completing a treatment intervention aimed at increasing task-oriented coping skills for this specific population to determine if these are, in fact, contributory to lower depression and stress levels. This would be important in order to determine which particular intervention was effective. That is, administering pre- and post-treatment measures of mood and stress would help identify whether it was the actual ability to learn and apply problem solving strategies that resulted in fewer stress and depression symptoms, and not the increased perception of control over life challenges. For such study, having pretreatment and post-treatment outcome studies, as well as a control group would be most beneficial, in order to measure treatment efficacy and compare these results with results of those who did not receive the intervention.

Summary and Conclusions

The present study investigated the relationship between type of coping style and clinical outcomes in individuals with brain injury who were enrolled in a post-acute rehabilitation program. Because task-oriented (i.e., problem solving) has been identified as a more adaptive coping strategy in patients with acquired brain injury who are living in the chronic stages of recovery, the study examined the relationship between task-oriented coping and executive functioning, adjustment, and participation abilities.

Results demonstrated that individuals who reported engaging in active problem solving (task-oriented coping) when faced with life problems experienced fewer symptoms of depression and stress. Further, those individuals who were rated by treatment team professionals who indicated that they had fewer limitations in their ability to initiate social contact and who appeared emotionally stable also endorsed lower stress. In contrast, having more life responsibilities to take care of, such as home, finances, and work, seemed to produce higher levels of stress for these participants. None of the proposed variables (executive functioning ability, adjustment, participation), however, predicted the use of task-oriented coping. Although significant correlations were found, a study with a larger sample size and with greater heterogeneity of participants who are living in the chronic stages of recovery after acquiring a brain injury would help expand upon these findings.

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