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Belief Structure and Coping Styles Following Closed Head Injury: Relationship to Injury Severity and Psychosocial Outcome

by

W. Allan D. Moore

A thesis

presented to the University of Manitoba

in partial fulfillment of

the requirements for the degree of

Masters of Arts

in

Department of Psychology

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BY

W. ALLAN D. MOORE

A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF ARTS

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Abstract

Coping behaviors, attributional styles and locus of control beliefs of 62 male head injured patients were examined to determine their relationship with initial injury severity and psychosocial outcome. Although attributional style and locus of control beliefs were not found to be related to injury severity, belief structures were found to be important moderators of quality of life outcome. Indiscriminant use of coping behaviors, negative attributional style and external locus of control beliefs were associated with poorer quality of life, while positive attributional style and internal locus of control was found to be associated with good outcomes. The implications of these findings for further research and intervention/rehabilitation with the head injured are discussed.

Belief Structure and Coping Styles Following Closed Head Injury: Relationship to Injury Severity and Psychosocial Outcome

The following research represents an attempt to bring together current theory in the area of cognitive mediation of stressful events and coping, and the growing base of data on the challenges confronted by the survivors of life-threatening illness. Specifically, the goals of this research are to investigate the relationship between attributional style, feelings of control, and the coping behaviors used by patients with closed head injuries (CHI), and to determine the relationship between these cognitive factors, and initial injury severity and long-term psychosocial outcome. As background to this study, three relevant research topics will be reviewed: a) the effects of closed head injury on cognition, behavior and emotion, b) attributional style, learned helplessness and its relation to depression, and, c) locus of control and its relation to coping. The central theme of this introduction is that CHI creates cognitive, behavioral and emotional sequelae that may influence attributional style and locus of control of CHI patients, which in turn may influence the effectiveness of coping strategies and the extent of psychosocial recovery.

CLOSED HEAD INJURY

Epidemiology and Pathophysiology of CHI

In our high speed society, cerebral trauma is the most common cause of damage to the brain in people under age 40 (Kolb & Whishaw, 1985, p.119). Cerebral trauma is caused by two forms of head injury - open head injuries, in which the skull is penetrated, and closed head injuries, in which the skull remains intact, although the brain sustains damage. Open head injuries are usually caused by gunshot wounds and are relatively infrequent in peacetime (Cooper, 1987). Closed head injury causes damage to the brain through: 1) abrupt linear acceleration/deceleration of the brain within the skull, 2) rotational forces which cause diffuse shearing of axons in the brain, 3) contusions caused by contact of the brain with the skull or tentorium, as well as 4) damage caused by increased intracranial pressure from intra or extracranial hematomas or swelling of brain tissue; and/or death of brain tissue due to low blood oxygen and/or low blood pressure (Bond, 1986; Teasdale & Mendelow, 1984)

Bond (1986) notes that young, single males account for the largest group of the head injured, with most of these patients sustaining their injuries as the result of motor vehicle accidents or assaults. Older patients (over age 65) tend to sustain CHI as the result of falls, domestic accidents, or motor vehicle accidents. Bond also reviews evidence that suggests that the modal CHI patient may be a young single male 'sensation seeker' who sustains a CHI partially as a result of engaging in risk-taking activities. Alcohol is a frequent precursor to these injuries.

Parkinson, Stephensen, and Phillips (1985) state that 2.2 of every 1000 Manitobans sustain closed head injuries per year. Nearly 7 million head injuries occur in the United States annually. Of these, 500,000 patients are admitted to hospitals and 100,000 die (Miller, 1986, p.347). As medical knowledge and technologies have increased, a larger number of patients are surviving what would previously have been fatal injuries (Eisenberg, Weiner & Tabaddor, 1987). Unfortunately, however, these survivors are also faced with long-term and perhaps permanent cognitive, behavioral, emotional and interpersonal deficits.

Cognitive Effects of Closed Head Injury

Among cognitive problems that arise following CHI, memory impairment is the most frequently reported deficit. Post-traumatic amnesia (PTA; time between injury and regaining continous day-to-day memory) commonly occurs following CHI and has been used as a predictor of later outcome. Most studies show a relationship between longer length of PTA and worse outcome (Brooks, 1984; Bond, 1986). Brooks (1984), in a review of the literature regarding memory deficits following CHI, reports that CHI patients have widespread memory problems when compared to normal controls. One of the most robust findings in this area is that CHI patients seem to have difficulty learning, and then recalling information after an intervening period of time. Brooks reviews several studies which suggest that CHI patients may also have impaired long-term memory, while retaining short-term, immediate memory skills.

Surprisingly, in view of the damage to the brain that accompanies CHI, intelligence generally returns to near premorbid levels following CHI (Bond, 1986). Severe injuries, however, are not incompatible with good recovery as measured by the WAIS (Bond, 1986). However, some deficits are usually found in nonverbal subscales (Brooks, 1984). This finding may be a

function of another problem CHI patients commonly report - that is, problems with attention and alertness. Van Zomeren, Brouwer, and Deelman (1984), in a review of experimental investigations of CHI attention problems, report that CHI patients may deal with distractions more slowly than normals, and that this is partially accounted for by a seemingly slower information processing speed. This may be a cognitive 'coping' strategy for dealing with information - maximizing quality over quantity of information processed.

Behavioral Effects of Closed Head Injury

Miller (1986) reports that personality and behavioral changes are often cited by family and hospital staff as the primary obstacle to reintegration back into society and resumption of normal life after CHI. DSM-III-R includes head trauma as an etiologic factor in 'Organic Personality Syndrome'. This syndrome is marked by: a) affective instability, b) recurrent outbursts of aggression or rage which are not justified, c) markedly impaired social judgement, d) marked apathy and indifference and e) suspiciousness or paranoid ideation (American Psychiatric Association, 1987, pp. 114-116). Bond (1984) notes that premorbid factors such as personality and personal and family

resources, the nature and extent of damage to the brain, and social factors such as interpersonal relations, social resources, and the presence or absence of compensation all contribute to the psychiatric consequences of CHI.

The most common behavioral syndrome following CHI is associated with the post-traumatic amnestic state, characterized by marked confusion and impaired attention and memory and restlessness (Bond, 1984). In later recovery, following discharge from hospital, Lezak (1978) notes five potential changes that may occur in the CHI patient's personality and behavior. They are: (a) impaired capacity for social perceptiveness (e.g., lack of empathy, self-criticsm), (b) impaired capacity for control and self-regulation, (c) stimulus-bound behavior (e.g., loss of ability to initiate and plan activities), (d) emotional changes (e.g., silliness, irritability, lability, apathy, changes to sexual drives), and (e) inability to learn from social experience.

As well, the so called 'frontal syndrome', marked by dishinibition, aggression, cognitive disability, and loss of insight is a frequently reported aftereffect of CHI. Bond (1984, p.168) cites a case in which a 24 year old married woman laughed uncontrollably for several minutes at frequent intervals and performed

inappropriate behaviors. To the extent that this patient had insight into her behaviors, she attempted, with little success, to control them. In addition, Bond notes that she developed a series of ritualistic behaviors, which Bond suggests may be an attempt on the patient's part to gain a sense of control over her daily activities. As well, Bond notes that the patient's self-control was at its best when her parents were around, and at its worst when the parents were away. This suggests that external factors played a role in self-control.

Wood (1984) notes that in addition to inappropriate behaviors of an aggressive and/or sexual nature, CHI patients may perform attention-seeking behaviors that may be of a destructive and/or bizzare nature (i.e., self-destructive acts). In addition, severe CHI patients may have very low drive and motivation, characterized by a lack of hedonic responses (earning rewards).

Emotional Effects of Closed Head Injury

As well as aggression, several other behavioral disorders commonly follow CHI. Bond (1984) notes that around the time that post-traumatic amnesia ends, CHI patients may pass through a period of time marked by hypomania or 'organic excitement'. Patients may also

begin exhibiting paranoid delusional behaviors, and Bond notes that these syndromes are most common in patients with left hemisphere damage. Schizophreniform psychoses are found to occur in post-CHI patients in higher rates than the normal population. Bond suggests that premorbid personality and social supports may be the most important factors in the development of schizophreniform syndromes. In addition, Bond notes that feelings of depression are common after CHI, and usually occur from 3-6 months post injury, and are frequently transient. Depressed affect is almost always related to growing awareness of physical, mental and social consequences of the CHI (Bond, 1984). Anxiety is less common among patients who sustain severe CHI, but is a common aftereffect of mild injury, and may contribute to a delay in returning to work (Bond, 1984). Stambrook, Peters, Moore, and Hawryluk (1988), in a study investigating quality of life outcome one to seven years post-CHI, report that severe CHI patients report feeling more depressed, hostile, and confused than moderately injured CHI patients. In addition, Stambrook, Moore, Peters, Zubek, and MacBeath (1989) report evidence that the the fallout from head injury is unique among patients who have experienced neurological trauma. Severely head injured patients were found to have greater psychosocial problems compared to survivors of spinal-cord injuries, while

spinal-cord injured patients experienced greater physical difficulties.

Several studies examining the families' perception of emotional changes in head injured relatives also provide evidence for emotional changes that occur after CHI (Peters, Stambrook, & Moore, 1988; Peters, Stambrook, Moore, & Esses, 1988; Lezak, 1978). Bond (1986), notes that relatives consistently report that patients display emotional changes including poor temper control, irritability, loss of control over mood and inappropriate social behavior such as excessive talking and childishness. In addition, relatives of CHI patients also often report personality changes that remain many years following the accident.

Interpersonal Effects of Closed Head Injury

The sequelae of CHI also impact upon the relatives of the CHI patient, perhaps to a greater extent than on the patient him or herself. Several studies have now turned to this overlooked area and have found evidence that the long-term stressors that are part of living with a head injured person have clear effects on the martial relationship and psychological status of relatives.

Stambrook, Moore, and Peters (1988) compared relatives ratings of social behavior and activity to norms compiled on normal and psychiatric groups. They found that patients with moderate CHI were rated less socially adapted than normals but more socially adapted than psychiatric patients. Severe CHI patients were rated as, or more socially impaired as psychiatric patients. The implication of this finding is that family members of CHI patients may share the social stigma that family members of a psychiatric patient may experience. Peters, Stambrook, Moore, and Esses (1988) found that in a group of married male CHI patients, affectional expression and dyadic adjustment, as perceived by the wives of the head injured patients, was lower when injuries were more severe. Peters, Stambrook, and Moore (1988) report that wives of severely injured husbands reported higher levels of depression than wives of less severely injured husbands. The degree of depression was found to be related to increased levels of general psychopathology displayed by their husbands. Lezak (1978) notes that caretakers of CHI patients typically feel trapped, isolated, abandoned by family and friends; may have unrealistic expectations for the patients recovery; and may be abused by the head injured patient. Personality changes also provide significant stressors for caretakers. The implication of these findings is that

the support system on which the CHI patient must depend is comprised of a very small number of people, very close to the head injured person, who are under a great deal of stress and having to deal with both the head injured persons and their own problems.

Summary

As we have seen, CHI is an increasingly common neurological condition in which survivors are faced with long-term and frequently permanent cognitive, behavioral, emotional and interpersonal sequelae. For the purposes of this study, the central point is that the sequelae of CHI may contribute to beliefs and attributions of the causes of these life changes, which in turn may interact with the patient's attempts to cope with the permanent changes in his or her life situation.

Adams and Lindemann (1974) suggest that four fundamental biological mechanisms are necessary for successful coping. These mechanisms include the ability for ambulation, sensing, energy production and cerebral integrating - all of which may be impaired in the CHI patient. The marked deficits in cognitive, behavioral, emotional and interpersonal areas suggest that the CHI patient is in a double bind situation, facing long-term and frequently permanent stressors

without adequate personal coping resources to deal with the effects of the CHI (Moore, Stambrook & Peters, 1988). The reviewed evidence suggests that the CHI patient has impairments in self-control of behavior and emotion, and frequently performs socially inappropriate behaviors. Also, CHI patients are frequently depressed following their injuries, and this depression may be related to awareness of the sequalae of the injury.

A number of possible explanations may account for this. Firstly, a lack of insight into these problems may produce a state in which the CHI patient is aware that behaviors or emotions are inappropriate, but is unable to appreciate that the head injury has created this situation. Alternatively, problems in cognitive processing, especially in abstract thinking, may preclude the CHI patient from learning to control his behavior and emotion. Finally, the CHI patient may be unaware of the inappropriateness of his or her behavior, but is aware of negative consequences without being able to make the connection between their antecedent inappropriate behavior and negative outcomes. What is common throughout these three scenarios is that the CHI patient may not have the cognitive abilities, either in terms of self-awareness, self-control or the ability to determine antecedents of consequences in his or her world to allow the

individual to act upon the environment. This may create feelings of helplessness in the CHI patient. We will see in the following pages that CHI may produce many of the sufficient conditions that lead to the development of a 'helpless' attributional style, and to believe that forces external to the self are responsible for things that happen to the CHI patient. Evidence will be reviewed that suggests that these beliefs and explanations that CHI patients may use to account for outcomes may also contribute to the use of ineffective coping strategies and poorer quality of life. We will turn next to review the background and assessment techniques of measuring attributional style, and look at how these methodologies will be used to investigate whether the constructs of learned helplessness and attributional style can contribute to our understanding of the emotional aftermath of CHI.

LEARNED HELPLESSNESS AND ATTRIBUTIONAL STYLE

Historical Background

Seligman (1975) reviewed the early experimental work, with animals, which led to the construct of learned helplessness. Using the triadic design, Seligman and his collegues were able to demonstrate that learned helplessness results from being unable to control a physical trauma and not through the simple experience of physical trauma. One group of dogs received escapable shock as a pretreatment before escape learning. A second group of animals were yoked to this first group, receiving the same temporal pattern and number of shocks but were unable to control receipt of shock. A third group received no pretreatment. Following this, the animals were placed into a shuttle aparatus in which they received a tone which signalled that a shock would be delivered. The animals could avoid or escape the shock if they jumped over a barrier placed between the two shuttle enclosures. Animals in the no treatment and pretreatment escapable shock groups quickly acquired the necessary escape response, jumping over the barrier before shock onset. The yoked animals who received

inescapable shock as a pretreatment however, did not learn the escape response but "gave up" - accepting the shocks passively until the trial ended.

Seligman (1975) notes that uncontrollable outcomes or, response-independent outcomes, lead to motivational deficits, disruption of learning, and emotional disturbance. We will now consider the evidence that Seligman presents concerning these effects as they occur in man. Hiroto (1974) used a very similar experimental design as described above to examine the effects of learned helplessness on motivation in university students. Pretreatment consisted of exposure to a loud noise in which one group could terminate the noise by pushing a button, and a yoked group who were powerless to stop the exposure, but who received the same temporal pattern and number of exposures. A third group received no preexposure to noise. The testing phase consisted of acquiring a 'finger shuttle' response - to terminate a loud noise, subjects had to move their finger from one side of a finger shuttle box to the other. As predicted, the helpless yoked pre-exposure group failed to acquire the escape response - most sat passively and tolerated the noise. In addition, Hiroto included one other important experimental manipulation. Half of the subjects in each group were told that their performance

on the finger shuttle task was a test of skill, while the other half of subjects were told that their performance was governed by chance. Chance subjects performed more helplessly than skill subjects in all groups, suggesting that locus of control of reinforcement also plays a role in learned helplessness.

Prior to the pretreatment, Hiroto (1974) also asked subjects to complete a personality inventory to determine whether they had an internal or external locus of control. A person who has an internal locus of control believes that things happen because of his or her actions, while a person with an external locus of control believes that things happen mostly as a function of fate or chance. Subjects who initially had an external locus of control tended to behave more helplessly in all groups as well. This suggested that three factors may contribute to the motivational deficits which appear in learned helplessness: 1) exposure to uncontrollable or noncontingent outcomes, 2) a cognitive set induced by chance instructions, and 3) having beliefs in an external locus of control.

Learned helplessness also creates cognitive deficits in the area of learning. Hiroto and Seligman (1975) preexposed university students to escapable, inescapable or no noise. Subjects then solved anagrams

that all had a similar pattern for their solution. Subjects who received inescapable noise solved fewer anagrams, and had great difficulty discovering the solution pattern. Miller and Seligman (1975) in a similar situation, found that learned helplessness produces a cognitive set in which subjects believe that their responses are independent of the outcomes - essentially reinforcing a belief in an external locus of control. Helpless subjects, who rated their expectancy for success on each trial, did not modify their expectancies following each success or failure as control subjects did. This cognitive set, Seligman suggests, makes it difficult for people to learn that their responses work.

Seligman (1975) notes that six symptoms of learned helplessness have parallels in the presentation of depression. They are : 1) lowered initiation of voluntary responses, 2) negative cognitive set, 3) the time course (helplessness and depression persist after multiple experiences), 4) lowered aggression, 5) loss of appetite, and 6) physiological changes (norephinephrine depletion, cholingeric overactivity). Seligman suggests that life events which teach people that control over one's life to relieve suffering or bring happiness is impossible creates both learned helplessness and depression.

Attributions, Helplessness and Depression

This formulation of the learned helplessness construct, in which motivational, cognitive and emotional factors arise from noncontingent outcomes has been modified to include a greater emphasis on the attributions, or internal explanations that people make (Abramson, Seligman & Teasdale, 1978). Two major inadequacies of the old theory have been noted: 1) it does not distinguish between cases in which only some people feel helpless (personal helplessness) and cases in which all people feel helpless (universal helplessness) and, 2) it does not explain the generality or chronicity of helplessness. The revision of the helplessness theory suggests that once a person perceives a noncontingent outcome, he or she engages in a cognitive process of looking for a cause or explanation of their helplessness. This involves making attributions regarding causality on three dimensions: 1) the cause can be stable or unstable, 2) global or specific, 3) internal or external. These attributions then influence the chronicity, generality, and self-esteem of the individual. Attributions which are unstable, specific and external produce expectations which do not readily transfer to other situations - in other words, very specific, short-lived effects which will not impact a great deal on a

person's self-esteem. On the other hand, stable, global, and internal attributions produce chronic effects which generalize to many areas of the person's life, and have a great impact on a person's self-esteem - leading to depression.

Specifically, the reformulated model of depression suggests that: 1) depression consists of motivational, cognitive, affective and self-esteem deficits; 2) when a person expects that highly positive events most likely will not happen and/or negative events most likely will happen, and nothing that the person does can influence this, depression (helplessness) results; 3) Generality of depressive (helplessness) deficits depends on global attributions, chronicity of deficits depends on stablitity of attributions, and the degree of internality of attributions effects the self-esteem of the person; 4) The intensity of deficits depends on the strength of the expectations, and affective and self-esteem deficits depend on the importance of the outcome.

Sweeney, Anderson, and Bailey (1986) report that in a meta-analysis looking at 104 studies investigating the relationship between attributional styles and depression, have found that for negative events, internal, stable and global attributions are related to depression, while for positive events, external,

unstable and specific causes were related to depression, supporting the reformulated model.

Barnett and Gotlib (1988), however, criticize the reformulated learned helplessness model. They point out that this model suggests that a premorbid self-deprecating attributional style should be a temporal antecedent of depression, but research has not supported this hypothesis. In addition, self-deprecating attributional style has not been found to predict an increase in depressive symptomatology over time, and among recovered depressives, no significant difference was found in negative attributional style compared to control subjects. Both of these findings are inconsistent with the model. Barnett and Gotlib (1988) point out that these findings are incomplete, and that a full test of the reformulated model within a full diathesis-stress model has not been conducted. They suggest that the assumption that attributional style is a trait-like cognitive state may be unfounded. They go on to suggest that negative attributional style may be more of a concommitant symptom of depression than a precursor, and provide evidence that attributional style may find its most important contribution in predicting the length of emotional dysphoria.

Supporting this line of reasoning, Parry and Brewin (1988) provide evidence that negative attributional style may be, in some cases, a concommitant symptom of depression. However, a combination of life stressors and negative attributional style was most associated with depressed mood. This current research seems to suggests that negative attributional style comes about as a result of life stresses, and therefore accompanies depressed mood as a concommitant symptom.

Alloy, Abrahamson, Metalsky, and Hartlage (1988) and Abramson, Metalsky, and Alloy (1989), in a clarification and expansion of the reformulated learned helplessness theory (which they call the hopelessness theory of depression), bring the helplessness theory in line with current research. They modify the theory in the following ways: 1) They hypothesize an etiological chain in which a stressful life event interacts with "depressogenic" attributional style to lead to depression and, 2) they suggest that attributional style contributes to, but is neither necessary nor sufficient for specific attributions concerning individual life events, and therefore, overall attributional style should be signficantly related to, but likely not fully correlated with depression.

Summary

As the reader will note, there are several similarities between the CHI patient and a person who is helpless. The sequelae of CHI in terms of motivational, cognitive and emotional problems are similar. The CHI patient may be inert, unable to plan and perform actions; he or she also has difficulty learning new things; and the CHI patient also commonly experiences depressed affect. In terms of the attributions that a CHI patient must make for these deficits, it appears that the CHI patient, especially if the injury is severe, is likely to make global, stable and internal attributions for his problems. For example, changes in personality which commonly follow CHI affect all areas of the patient's life, are permanent and are internal. Alternatively, patients with life-threatening illnesses may make global, stable and external attributions - blaming deficits on the disease rather than attributing the cause of outcomes as arising from themselves. This type of attribution would be likely to be associated with better outcome, but, may be unlikely for the CHI patient given the unique kinds of outcomes and events that the CHI patient must make attributions about. The permanent and pervasive changes which accompany CHI in behavioral, emotional, cognitive, and interpersonal

domains are integral to the person, and despite being brought about as a result of the injury, come from the person him or herself, unlike symptoms and syndromes which are more physical rather than psychological in nature associated with other life-threatening illness. The unique challenges faced by the CHI patient may make internal attributions more likely than the more adaptive external attributional style.

To sum up, the CHI patient, as a result of the sequelae of the injury, is at risk for developing a negative attributional style to explain deficits which in turn, may lead to a state of learned helplessness. Feelings of helplessness create motivational, cognitive and emotional problems that may compromise the patients effective use of coping strategies and ultimately lower the patient's optimal quality of life. In addition, work by Hiroto (1974) and Miller and Seligman (1975) shows a connection between feelings of helplessness and external locus of control. We will turn next to investigate how the construct of locus of control may be a useful explanatory vehicle to account for how the CHI patient copes with the sequelae of the injury and how it can affect psychosocial outcome.

LOCUS OF CONTROL

Historical Background

The locus of control (LOC) construct has been used extensively to investigate the effects of generalized expectancies of internal (within the person) or external (outside the person) forces being responsible for reinforcement. Unfortunately, this construct has been viewed by many investigators as a "trait" or stable personality characteristic that applies to many domains. Lefcourt (1981) notes that the original intent of the construct was to provide a convienient abstraction that describes an individual's causal beliefs, and emphasizes that LOC is not unidimensional. Hence, different LOC scales should be developed for specific target domains to investigate this construct.

Lefcourt (1984) notes that the first LOC scale was developed by Phares (1955) and James (1957) was designed to determine whether people had relatively stable attitudes regarding the causes of outcomes, and whether these attitudes influence behavior. Contrary to popular belief, the next LOC scale, the popular Rotter's I-E Scale (Rotter, 1966) was initially

designed to assess LOC in a multidimensional fashion but, because of a failure of a factor analysis to differentiate between the intended scales, the instrument was paired down to the familiar 23-item single factor scale (Lefcourt, 1981). Researchers have, unfortunately, used this scale to investigate LOC as a trait construct, or typology, suggesting that internals are well adjusted and externals are maladjusted.

Currently, new scales have been developed to improve that validity and specificity of measuring LOC. One direction of this is exemplified by Levenson (1974) who expanded her LOC scale to include the fact that external LOC can be broken down into beliefs that powerful others control outcomes or that chance controls outcome. In addition, new LOC scales have been developed to assess LOC beliefs in specific areas of a person's life. An example of this class of LOC scale is the Multidimensional Health Locus of Control Scale (MHLC) constructed by Wallston and Wallston (1978). This scale assesses the control beliefs that people have concerning their health. It is also divided into a three factor scale measuring Internality, Powerful Others and Chance. To sum up, the LOC construct has been misinterpreted by investigators in the past who have viewed LOC as a

static or unidimensional trait or typology. LOC should be viewed as a construct that is multidimensional in nature and may vary depending on the type of outcomes one is assessing. To this extent then, this study will incorporate both the Levenson (1974) and Wallston and Wallston (1978) multidimensional scales. The MHLC scale will be used to investigate control attitudes that CHI patients have concerning their health, while Levenson's scale will be used to investigate control attitudes concerning CHI patient's life situation in general. We will turn next to look at the contribution that the LOC construct has made to our understanding of how people cope with life stress and chronic illness, and how this may effect recovery and quality of life following CHI.

Locus of Control and Coping Strategies

A growing number of studies have investigated the effects of chronic illness on LOC and the interaction of LOC beliefs and coping strategies. Sandler and Lakey (1982) have suggested that internal LOC beliefs buffer stressful life events since internal LOC is associated with better use of social support structures as a coping strategy. Lefcourt, Martin and Saleh (1984) report that persons with an internal LOC may benefit more from social supports than persons with an

external LOC. Supporting this research, Grace and Schill (1986) found that among university students, high internal LOC is associated with higher use of seeking social support coping strategies. Internal LOC may also be associated with a higher incidence of seeking out relevant sources of information concerning a stressful situation (Phares, 1976, pp. 60-79).

Lefcourt (1981b) reviews the "hardiness" construct coined by Kobasa and her collegues. People who are more "hardy" have a high internal LOC, are committed and are adventurous, thrive on challenges and are less affected by stressful life events. Ironically, the sensation-seeking CHI patient may premorbidly possess several of the "hardiness" traits which may both contribute to their initial injury, and may serve them well in recovery from CHI. Johnson and Sarason (1978) found that undergradates with external LOC beliefs become more depressed and anxious following stressful life events. Miller, Ware, Sherk and Lefcourt (1981) suggest that irrespective of LOC, people are affected by life stress. However, persons with an external LOC tend to continue to have difficulty long after the negative event while people with an internal LOC seem to be able to go on and leave the event behind.

Two studies investigating the relationship of LOC beliefs and use of coping strategies in normals have

found that, in general, higher internal LOC is associated with more effective (as measured by validation measures) and extensive coping strategies, while higher external LOC is associated with use of externalizing defenses such as displacement of responsibility (Parkes, 1984; Vickers, Conway & Haight, 1983). Solomon, Mikulincer, & Avitzur (1988) found that in a longitudinal study of soldiers suffering from post-traumatic stress disorder, decreased stress symptoms were associated with more internal locus of control, less emotion-focused coping and less distancing. Finally, Frank et al. (1987) report that in an investigation of coping strategies utilized by spinal-cord injured patients (a commonly used control group for CHI), higher internal LOC was associated with more extensive and effective coping strategies.

Several studies have also noted relationships between LOC beliefs, extent of illness symptoms, and associated psychological problems in a variety of illnesses. Kiecolt-Glaser and Williams (1987) report that among burn patients, higher beliefs in chance LOC (measured by the MHLC) was related to higher ratings of patient pain as made by nurses. Lee (1985) reports that among patients sustaining an occupational hand injury, compared to a non-patient group of worker controls, hand injury patients had higher external LOC

beliefs and reported more psychological difficulties. Steinhausen (1982) has reported that severe chronic illness and accompanying greater psychiatric distrurbance among children and adolescents is associated with higher externality of locus of control. In an investigation exploring the relationship of LOC beliefs in a group of elderly chronically ill patients (diabetics, hypertensives and pulmonary disease patients), Nagy and Wolfe (1983) found that higher self-reports of illness symptoms were related to lower internal LOC beliefs, and that higher satisfaction with treatment was associated with high powerful others LOC beliefs.

Strickland (1978) reviews a great deal of evidence linking external LOC with poorer physical and psychological state following a number of psychiatric and physical illnesses. She suggests that persons with a high internal LOC may become more anxious about their condition and use denial to deal with their anxiety. She notes that persons with an internal LOC are able to utilize specific information concerning their illness, while externals respond to general instructions. The implications of this is that persons facing an overwhelming life change as is the case following CHI may be better adjusted if they 'deny' their deficits. Such a strategy would allow patients to feel better

about themselves, and use effective direct-action coping strategies - involving compliance and complex health promoting behaviors.

To sum up, the consistent finding in all of these studies is that internal LOC is associated with more effective use of coping strategies and better adjustment, while external LOC is associated with ineffective coping strategies and greater physical and psychological distress.

Summary

The LOC construct, although it has generated a great deal of research into the role of expectations of control, has also been misinterpreted as reflecting a unidimensional typology or stable personality trait. Instead, multidimensional and specific scales must be used to assess LOC in different belief areas to maximize validity of results.

Internal LOC has also been found to be related to effective and eclectic coping styles, while external LOC has been associated with greater physical and psychological difficulties following illness. The CHI patient, dealing with the motivational, cognitive, behavioral and interpersonal sequelae of the injury, must also have locus of control beliefs concerning his

or her life situation. It would appear, based on this review of the learned helplessness and attributional style literature, that the CHI patient may be predisposed to make stable, global and internal attributions - concerning major life events. CHI patients may attribute the sequelae of their injuries as coming from within (internal attribution), and also as events over which they have no control (external LOC).

Figure 1 outlines a model of how these belief structures may come about in the CHI patient. After experiencing the life changes that the sequelae of CHI brings, the patient first asks him or herself about how and why the events came about. This process might be termed a search for the location of the change. This search may lead to the formation of a negative attributional style. Secondly, the patient asks him or herself about the possible response to this change - what can be done, and what is the likelihood of success. Given the effects of the negative attributional style, and the sequelae of the head injury, it appears likely that the CHI patient will adopt an external LOC, believing that he or she has little or no control over what happens. This belief structure may in turn promote greater physical and psychological distress, as well as being associated

with maladaptive use of coping strategies. It is this model that is tested in the current study.

Insert Figure 1 about here

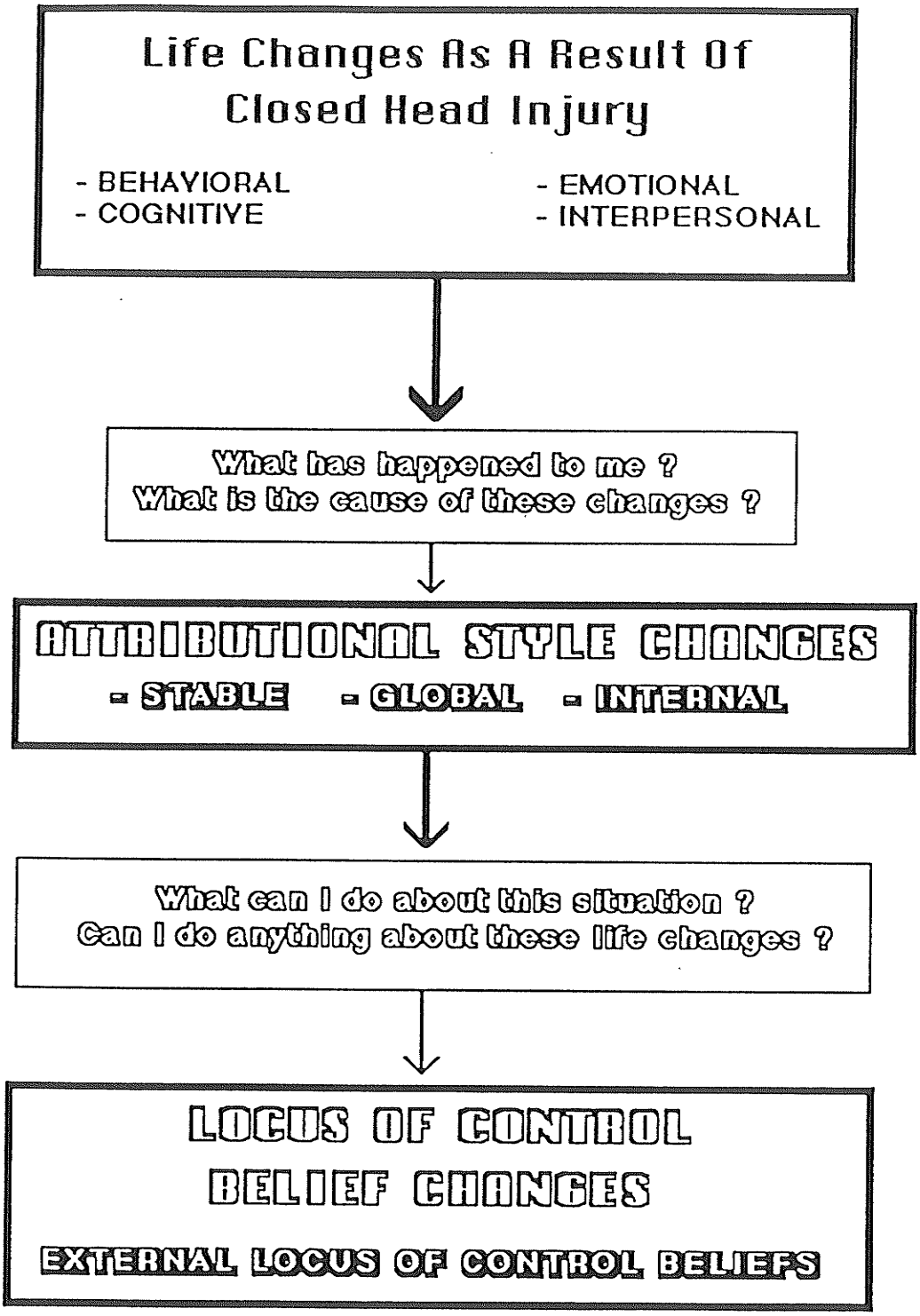


FIGURE 1. The process of belief structure change in the head injured patient.

OVERALL SUMMARY AND STATEMENT OF PROBLEM

The current study investigated the hypothesized connection between locus of control beliefs, attributional style and coping following closed head injury. Specifically, effective coping strategies (as defined by association with better psychosocial adjustment) are hypothesized to be associated with internal locus of control beliefs, and unstable, specific and external attributional styles for negative events. In addition, the current study views LOC, attributional style, coping strategy, and psychosocial outcome as being affected by the nature and severity of the initial injury. The current model views LOC, attributional style and coping strategy as being interrelated - and in turn, these cognitive factors are also interrelated with psychosocial outcome.

Insert Figure 2 about here

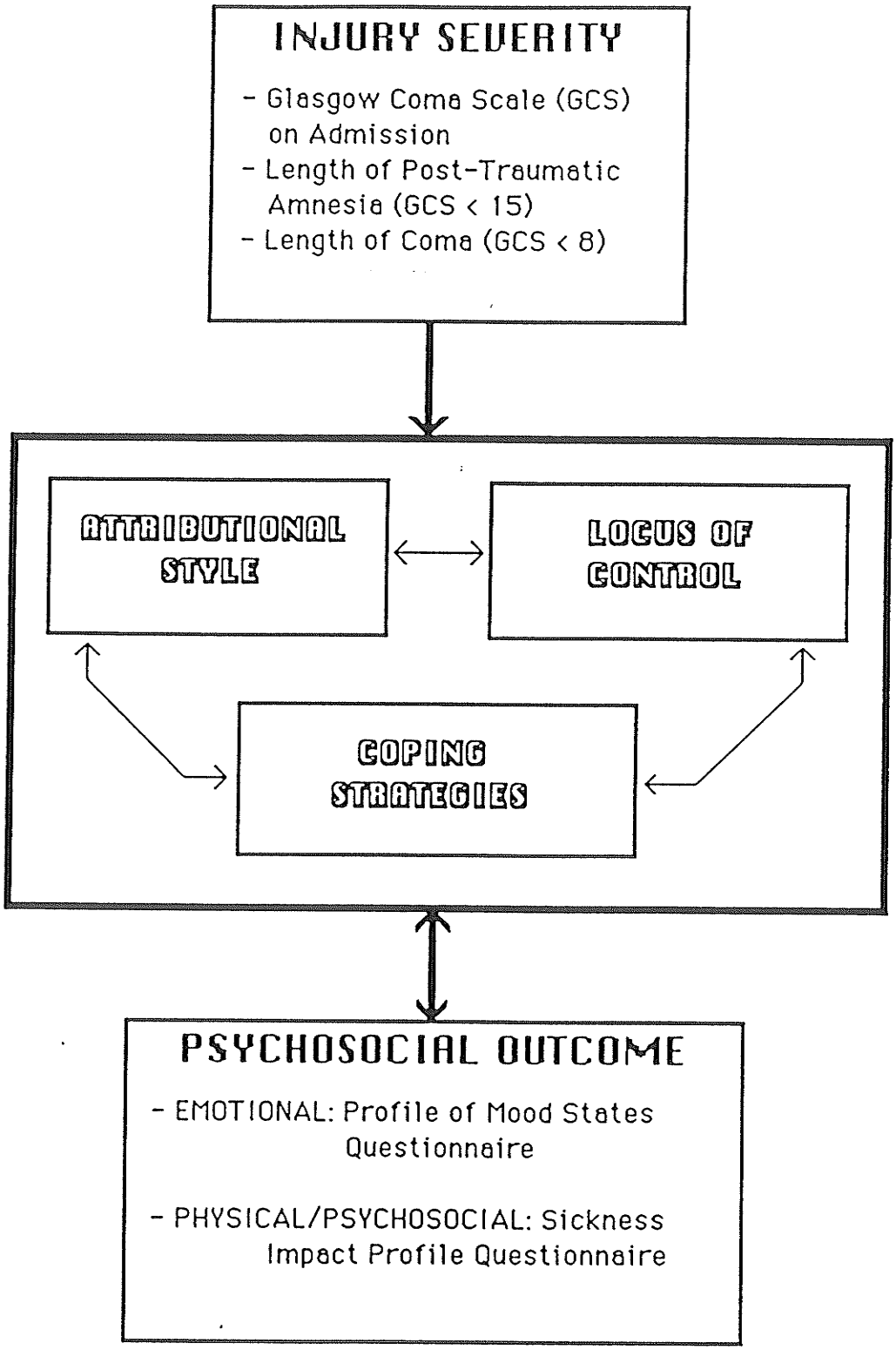


FIGURE 2. Conceptual model for the present study.

Current LOC beliefs, attributional style, coping strategies and psychosocial outcome were assessed using self-report instruments, while the severity of initial injury data consisted of archival medical data collected on these CHI patients.

HYPOTHESES

Based on the literature review, and the interviews the author has had with nearly 100 head injured patients and their families, the following hypotheses are advanced:

Hypothesis 1

Effect of Injury Severity on Belief Structure

Higher external LOC measures on both the Revised I-E scale and the MHLC as well as greater global, stable and internal attributional styles for negative events will be associated with lower GCS and the use of neurosurgical intervention in treatment of the injury.

Hypothesis 2

Relationship Between Coping Strategies, Belief Structure and Outcome

Coping strategies associated with better psychosocial outcome will be related to higher internal LOC beliefs, and unstable, specific and external attributional styles.

METHOD

Subjects

Subjects were recruited from a potential pool of 131 male head injury patients, who previously participated in a multidimensional assessment of quality of life following CHI. In the initial study, these patients had been admitted to the Health Sciences Center or St. Boniface General Hospital between 1981 and 1987. They were selected initially on the basis of International Classification of Diseases - 9th Edition - Clinical Modification diagnoses reflective of closed head injury. Nine hundred and thirty-eight patient records were reviewed and of these, 418 met inclusion criteria (were unconscious following injury for at least 5 minutes), and were contacted. Two hundred and twelve patients were successfully contacted and of these 131 participated, approximately a 52% compliance rate. The patients completed a life change questionnaire assessing how their head injuries had changed their lives in a number of areas. Each patient was adminstered the Sickness Impact Profile (SIP; Bergner, Bobbitt & Pollard, 1976), the Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1971), and

the revised Ways of Coping Questionnaire (WOC-R; Folkman, Lazarus, Dunkel-Schetter, DeLongis & Gruen, 1986). A close family member completed a number of questionnaires designed to assess the effects of stress brought on as a result of the relative's CHI.

In the current study, 7 of the 131 potential subjects files were not available since these files were in use in another study. Twenty-two of the remaining 124 potential subjects were eliminated before recruitment because these patients were in a persistant vegatative state (3 subjects), or had not completed large sections of previously administered questionnaires (19 subjects). It was assumed that these subjects would not be able to complete the current battery of questionnaires. The remaining 102 patients were contacted by letter and telephone and invited to participate in the current study. Of these, 14 patients were not located, leaving 88 who were contacted, of which 6 refused to participate. Eighty-two patients were sent questionnaires, and following follow-up telephone calls and a reminder letter, 62 booklets were returned. Overall, the response rate for all subjects contacted was 70.5% (62 out of 88 subjects complying).

Assessment Instruments

The Attributional Style Questionnaire

Attributional style was assessed using the Attributional Style Questionnaire (ASQ; Peterson, Semmel, von Baeyer, Abramson, Metalsky, & Seligman, 1982). The ASQ presents twelve events, broken down into three good achievement and affiliation outcomes and three bad achievement and affiliation outcomes (e.g., you become very rich [good achievement], you go out on a date and it goes badly [bad affiliation]). Subjects were then asked to generate a cause for this event themselves and then rate the extent to which that cause is due to internal-external reasons, the stability of this cause, the globality of the cause and the importance of this situation. A variety of levels of subscales are possible, the finest level of detail involving the globality, stability and internality of good achievement, good affiliative, bad achievement and bad affiliative events. The combination of affiliation and achievement events, yields an overall attributional style for good and bad events. A combination of the globality, stability and internality scores for good events and bad events is used to arrive at a composite positive and composite negative score, and finally, a composite postitive minus composite negative score can be calculated.

Cronbach's alpha of .75 and .72 were calculated following administration of the ASQ to 130 male and female undergraduates (Peterson et al., 1982), and test-retest reliabilities (over a five week inter-test period) ranged from .57 for globality of attributions for bad events to .69 for stability of attributions for bad events. Tennen and Herzberger (1985) review several studies which demonstrate the validity of the ASQ. The vast majority of the studies used in the meta analysis by Sweeney et al. (1986) used the ASQ to measure attributional style. The scale, in its entirety, is presented in Appendix A.

The Revised Internal-External Locus of Control Scale

The Revised I-E scale is made up of 3 subscales (Powerful Other external LOC [P], Chance [C] external LOC, and Internal [I] LOC) consisting of eight seven-point Likert items. Levenson (1981) reports moderately high Kuder-Richardson reliability coeffiecients when the scale was used in a student sample (.64 for I scale, .77 for P scale and .78 for C scale), but notes that such results are to be expected as the items sample from a variety of situations. Test-retest reliablities are reported in the .60 to .79 range Levenson (1981). Levenson reports that the validity of the three subscales has been investigated through

correlational analyses that have found that the P and C scales are related (.41 to .60) but are unrelated to the I scale (-.25 to .19), relationships which are expected. In addition, factor analyses conducted on results obtained from both university student and psychiatric populations have confirmed the makeup of the subscales. The Revised I-E scale is presented in its entirety in Appendix B.

The Multidimensional Health Locus of Control Scale

The MHLC scale consists of two alternate forms, each having three subscales made up of six six-point Likert items: Internal Health Locus of Control (IHLC), Chance Externality of Health Locus of Control (CHLC) and Powerful Others Externality of Health Locus of Control (PHLC). In the current study, both forms were combined into a single instrument as Wallston and Wallston (1981) report that internal consistency increases significantly over that obtained when a single form is used. Cronbach's alpha coefficients for the single form range from .67 to .77, while coefficients range from .83 to .86 when both forms are combined (Wallston & Wallston, 1981). Test-retest reliabilities have not been reported. As the scale was constructed based on Levenson's Revised I-E scale, one might expect to find the same intercorrelations between

the CHLC and PHLC as the C and P scales in Levenson's scale, and these also exist (.60). Wallston and Wallston (1981) also report that the subscales are highly correlated with simple self-report ratings of internality, powerful others and chance health locus of control, demonstrating the validity of the scale. The MHLC scale is presented in its entirety in Appendix C.

The Revised Ways of Coping Questionnaire

The revised Ways of Coping Questionnaire (WOC-R) (Folkman, Lazarus, Dunkel-Schetter, DeLongis & Gruen, 1986) is a patient-self report measure of the use of coping strategies. The scale is made up of 66 four point Likert type items, each consisting of a possible coping strategy. Respondents are asked to indicate to what extent they used each particular coping strategy to adjust to their current difficulty. The entire WOC-R questionnaire is reproduced in Appendix D. Factor analyses based on responses from a patient subsample have identified eight subscales: confrontative coping, planful problem solving (both of which are direct action strategies), accepting responsibility, distancing, self-controlling, escape avoidance, and positive reappraisal (palliative strategies) and seeking social support (a combination of direct action and palliative strategies). Folkman et al. (1986) report Cronbach's alpha's ranging from .61 to .79, and

intercorrelations between the scales ranging from -.04 to .39. Test-retest reliablities were not reported.

Nature and severity of initial injury

The nature and severity of the initial injury was measured by Glasgow Coma Scale (GCS) score (Teasdale & Jennett, 1974) within six hours of admission to hospital, length of post-traumatic amnesia (PTA), length of coma, computerized tomography (CT) results and presence/absence of surgical intervention. The GCS is a standardized measure of depth of unconsciousness consisting of ratings on a five point scale of extent of eye opening, verbal responsiveness and motor response. The GCS in presented in its entirety in Appendix E. A score of 15 indicates full consciousness, while a score of 3 indicates deep coma. A GCS score is regularly obtained while a patient is unconscious and during recovery by medical staff and is recorded on medical records.

Patients were assigned to severity groups based on the initial severity of the injury, based on GCS scores on admission, and the presence or absence CT damage or neurosurgery (see Figure 3). This method of grouping patients is widely utilized in the literature (Klonoff, Costa & Snow, 1986; Klonoff, Snow & Costa, 1986; Levin, High, Goethe, Sisson, Overall, Rhoades, Eisenberg,

Kalisky, & Garrx, 1987). According to this grouping technique, 11 patients were found to have sustained mild injuries, 30 sustained moderate injuries and 21 patients sustained severe head injuries.

Insert Figure 3 about here

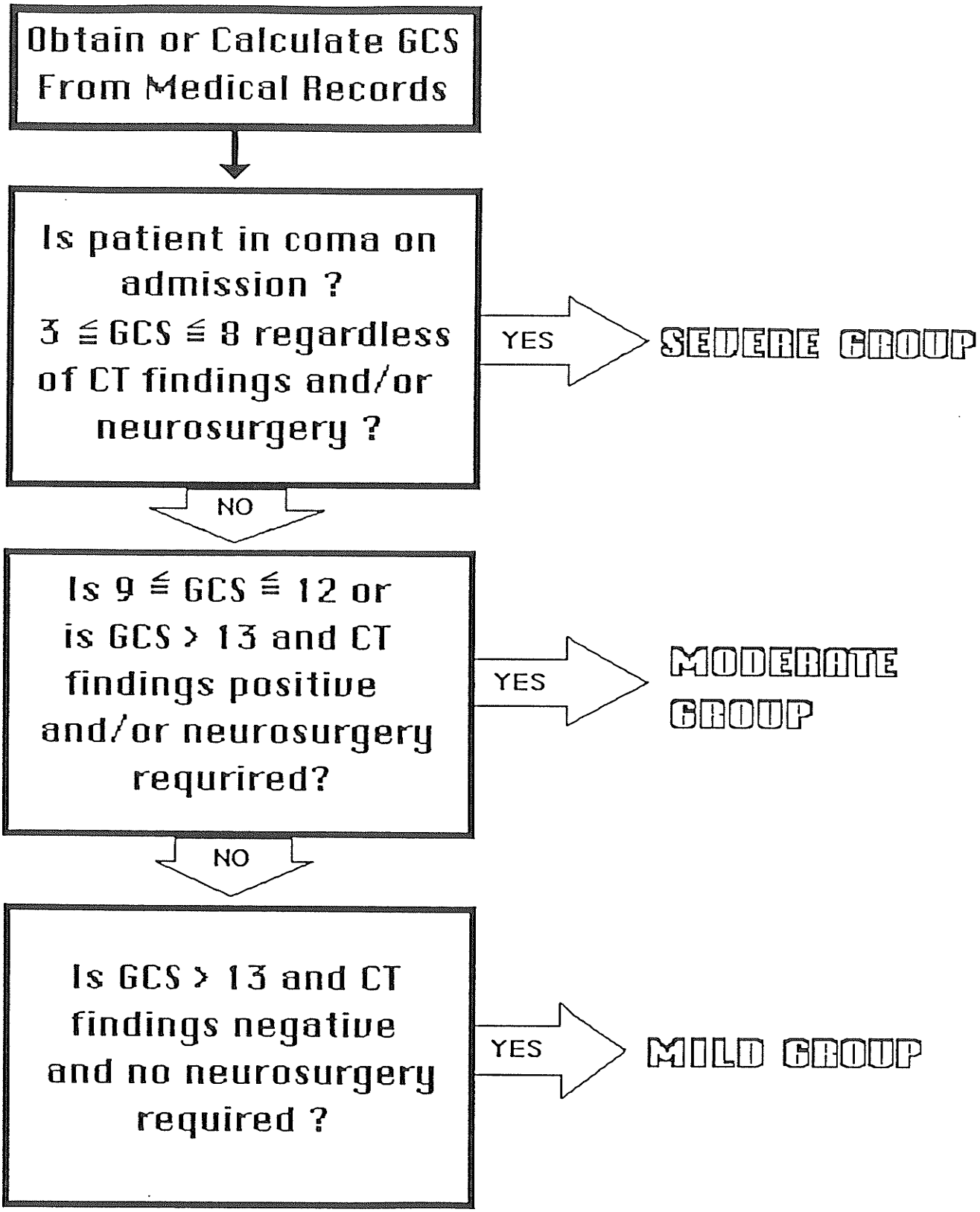


FIGURE 3: Decision tree for classification of patients as Mild, Moderate, or Severe Head Injury

Psychosocial Outcome

Sickness Impact Profile. The Sickness Impact Profile (SIP; Bergner, Bobbitt & Pollard, 1976) is a patient self-reported measure of psychological and physical problems and assessed emotional, psychosocial and physical problems arising from the head injury as perceived by the head injured person.

Profile of Mood States. The Profile of Mood States Questionnaire (POMS; McNair, Lorr & Droppleman, 1971) is a patient self-report of emotional status. This instrument measured the extent of emotional distress - including depressed affect - as perceived by the head injured person.

Procedure

Potential participants were contacted by letter and asked to participate in the study (see Appendix F for the contact letter). Follow-up telephone calls were begun two weeks following the mailing of the first letter and each potential subject was asked to participate. Following receipt of the patient's agreement to participate, the ASQ, Revised I-E Scale, MHLC, WOC-R, POMS and SIP was sent by mail to the patient along with instructions on how to complete the questionnaires. A follow-up telephone call was made

approximately two weeks following mailings which gave subjects an opportunity to ask questions and served as a prompt to complete and return the questionnaire. A reminder letter was sent to prompt completion approximately four weeks following mailings, and a second telephone follow-up call was made approximately one week later. A final follow-up letter describing the purpose and findings of the study was also sent to the participants (see Appendix G).

RESULTS

Three sets of analyses were undertaken to explore the effects that cognitive modifiers of outcome may have on quality of life following CHI.

Hypothesis 1:Effect of Injury Severity on Belief Structure

The first set of analyses investigated whether different groups of CHI patients have differing ASQ, Revised I-E and MHLC scores. For each of the MHLC, ASQ and Revised I-E instruments, a Multivariate Analysis of Variance Analysis (MANOVA) was conducted to determine overall effects, followed by Tukey's Honestly Significant Difference multiple comparision tests were performed to determine whether attributional style or locus of control differ between injury severity groups.

Attributional Style Questionniare. Table 1 provides the means and standard deviations for all scales of the ASQ for each of the severity groups. The Multivariate Analysis of Variance tests were broken down into two sections, the first incorporated the individual positive and negative internal, global and stable scales. The second incorporated the summary

scales less the Composite Positive/Negative scale, as inclusion of this scale in the summary scale MANOVA would have resulted in a singular matrix. A univariate ANOVA is reported for the Composite Positive/Negative scale.

Insert Table 1 about here

Table 1

The Attributional Style Questionnaire: Effect of Severity Group

	Mild (N=11)		Moderate(N=30)		Severe(N=21)	
Scale	Mean	S.D.	Mean	S.D.	Mean	S.D.
Positive Event Attributions						
Internal	5.22	1.06	5.56	1.25	5.39	1.23
Stable	5.46	0.94	5.67	1.11	5.63	0.98
Global	4.92	1.18	5.32	1.23	4.98	1.27
Negative Event Attributions						
Internal	4.46	0.89	4.04	1.19	4.67	1.53
Stable	4.21	1.15	4.27	1.14	4.42	1.17
Global	3.57	1.00	3.79	1.53	3.96	1.49
Composite Scales						
Helpless	7.78	1.15	8.06	2.39	8.38	2.23
Hopeful	10.37	1.77	10.99	2.13	10.61	1.92
Negative	12.25	1.93	12.10	2.96	13.06	2.94
Positive	15.59	2.54	16.55	3.09	16.00	2.79
Positive-Negative	3.35	2.69	4.45	3.83	2.94	3.90

The MANOVA for the positive/negative internal, global and stable scales was nonsignificant (Hotelling's T^2 = 0.114, Equivalent Multivariate F (12,94) = 0.445, p < .940), as were all univariate F tests (all p's > .25). As well, the MANOVA for the composite scales was nonsignificant (Hotelling's T^2 = 0.087, Equivalent Multivariate F (8,98) = 0.445, p < .828), as were all univariate F tests (all p's > .52). The univariate F test for the Composite Positive/Negative score was also nonsignificant (F(2,53) = 0.989, p < 0.378). No significant differences were found between the groups in a priori post-hoc analyses using Tukey's Honestly Significant Difference Procedure.

Revised Internal-External Locus of Control Scale. The MANOVA for the Revised I-E Scales was nonsignificant (Hotellings T^2 = 0.039, Equivalent Multivariate F (6,104) = 0.334, p < .918), as were all univariate F tests (p's > .52). No differences between groups were found. Means and standard deviations for the Revised I-E Scale are presented in Table 2.

Insert Table 2 about here

Table 2

The Revised Internal/External Locus of Control Scale: Effect of Severity Group

	Mild (N=11)		Moderate(N=30)		Severe(N=21)	
Scale	Mean	S.D.	Mean	S.D.	Mean	S.D.
Internal	38.82	5.67	38.93	4.34	37.79	6.03
Powerful Others	26.54	6.25	25.39	6.06	24.53	7.86
Chance	26.63	7.92	24.07	5.95	24.95	5.58

Multidimensional Health Locus of Control Scale. The MHLC scale MANOVA was also nonsignificant (Hotellings T^2 = 0.074, Equivalent Multivariate F (6,104) = 0.637, p < .700), as were all univariate F tests (p's > .19). As indicated in Table 3, no between group differences were found.

Overall, these analyses do not support Hypothesis 1 - instead, they suggest that initial injury severity does not have an influence on the belief structure of the CHI patient. The implications of this finding are discussed later.

Insert Table 3 about here

Table 3

The Multidimensional Health Locus Of Control Scale: Effect of Severity Group

	Mild (N=11)		Moderate(N=30)		Severe(N=21)	
Scale	Mean	S.D.	Mean	S.D.	Mean	S.D.
Internal	25.59	3.71	26.14	4.54	27.00	5.48
Powerful Others	21.55	7.02	19.68	6.42	19.05	5.25
Chance	20.64	2.53	17.18	5.63	17.40	6.29

Hypothesis 2: Relationship Between Coping Strategies, Belief Structure and Outcome

Hypothesis 2: Univariate Correlational Analysis

Bivariate Pearson correlation coefficients were calculated in an effort to determine the relationships between WOC-R, ASQ, Revised I-E, and MHLC scores and summary measures of outcome. The summary measures of outcome included the POMS Depression/Dejection subscale, the POMS Total Score, and the SIP Physical Dimension, SIP Psychosocial Dimension and SIP Total Score subscales.

Ways Of Coping-Revised and Outcome. Table 4 provides the correlation matrix between summary outcome measures and WOC-R reported coping strategies. Escape Avoidance coping strategies were found to be correlated with poorer outcome, as measured by the POMS Depression/Dejection and Total Mood Disturbance scales as well as the SIP Psychosocial Dimension and SIP Total Score (p's < .05). Engaging in Confrontative Coping strategies showed a trend to be associated with greater total mood disturbance as measured by the POMS (p < .1). Positive Reappraisal was found to be associated with less total mood disturbance (p < .05).

Insert Table 4 about here

Table 4

Univariate Pearson Correlations Between Coping Strategies and Summary Outcome Measures

Scale	POMS Depression Dejection	POMS Total Mood Disturbance	SIP Physical Dimension	SIP Psychosoc Dimension	SIP Total Score
Confrontative Coping	.178	.257 #	.154	.155	.179
Distancing	-.077	-.025	.045	-.024	.043
Self-Controlling	-.024	-.025	.055	.025	.082
Seeking Social Support	.199	.195	.021	.009	.074
Accepting Responsibility	-.045	-.020	-.007	.008	.040
Escape Avoidance	.423 ***	.483 ***	.131	.365 **	.307 *
Planful Problem Solving	-.157	-.122	.017	-.134	-.065
Positive Reappraisal	-.215	-.269 *	-.142	-.175	-.169

Note. *** $p < .001$, ** $p < .01$, * $p < .05$, # $p < .1$

All Significance levels are two-tailed.

Attributional Style and Outcome. Table 5 presents the correlation matrix between ASQ scales and summary outcome measures. Greater depression/dejection, psychosocial difficulties and overall SIP scores were associated with internal attributions for negative events ($p < .05$), and showed a trend to be associated with total mood disturbance ($p < .1$). Global attributions for negative events were also correlated with higher depression/dejection ($p < .05$). These results are mirrored in the finding that higher composite negative attributional style was associated with greater depression ($p < .05$), and a trend to be associated with greater psychosocial problems and higher overall SIP score ($p < .1$). In addition, greater positive versus negative attributional style showed a trend to be associated with decreased depression/dejection ($p < .1$). Surprisingly, internal and stable attributions for positive events were related to increased physical concerns ($p < .05$), and greater stable attributions for positive events was also related to greater total SIP score ($p < .05$). Similarily, a trend was noted suggesting positive composite attributional style is associated with greater physical problems ($p < .1$).

Insert Table 5 about here

Table 5

Univariate Pearson Correlations Between Attributional Style and Summary Outcome Measures

Scale	POMS Depression Dejection	POMS Total Mood Disturbance	SIP Physical Dimension	SIP Psychosoc Dimension	SIP Total Score
Positive Events					
Internal	.051	.047	.267 *	.057	.186
Stable	.184	.182	.268 *	.194	.293 *
Global	-.198	-.148	.079	-.039	.062
Negative Events					
Internal	.285 *	.243 #	.179	.381 **	.360 **
Stable	.073	-.034	-.023	-.081	-.060
Global	.273 *	.197	.077	.212	.201
Composite Scores					
Hopeful	-.045	.001	.187	.076	.189
Hopeless	.216	.113	.038	.096	.099
Negative	.299 *	.206	.112	.249 #	.243 #
Positive	-.010	.020	.239 #	.076	.208
Positive-Negative	-.235 #	-.132	.103	-.129	-.021

Note. *** $p < .001$, ** $p < .01$, * $p < .05$, # $p < .1$

All significance levels are two-tailed.

Revised I/E Locus of Control and Outcome. Univariate Pearson r's were also calculated between the Revised I/E scale and summary outcome measures, and these are presented in Table 6. Although internal locus of control was associated with lesser disturbance on all summary scales, these did not reach significance using two-tailed tests of significance. Greater physical disturbance was associated with greater chance external locus of control ($p < .05$), and a similar trend was noted for overall SIP score ($p < .01$).

Insert Table 6 about here

Table 6

Univariate Pearson Correlations Between Revised Internal/External Locus of Control Scale and Summary Outcome Measures

Scale	POMS Depression Dejection	POMS Total Mood Disturbance	SIP Physical Dimension	SIP Psychosoc Dimension	SIP Total Score
Internal	-.218	-.195	-.206	-.163	-.169
Powerful Others	.148	.152	.011	.136	.081
Chance	.162	.174	.278 *	.201	.250 #

Note. *** $p < .001$, ** $p < .01$, * $p < .05$, # $p < .1$

All significance levels are two-tailed.

Health Locus of Control and Outcome. Pearson r's were also calculated between MHLC scales and summary outcome measures (see Table 7). Internal locus of control for health concerns was also associated with lesser disturbance on all summary outcome measures, reaching significance in the SIP physical dimension ($p < .05$), with a trend with overall SIP score ($p < .1$). Powerful others external locus of control was associated with greater physical concerns and overall SIP score ($p < .05$), and greater chance health locus of control was associated with greater depression/dejection, total mood disturbance, physical concerns and overall SIP score ($p < .05$).

Insert Table 7 about here

Table 7

Univariate Pearson Correlations Between Multidimensional Health Locus of Control and Summary Outcome Measures

Scale	POMS Depression Dejection	POMS Total Mood Disturbance	SIP Physical Dimension	SIP Psychosoc Dimension	SIP Total Score
Internal	-.209	-.173	-.270 *	-.171	-.224 #
Powerful Others	.176	.155	.329 *	.159	.284 *
Chance	.380 **	.372 **	.396 *	.213	.277 *

Note. *** $p < .001$, ** $p < .01$, * $p < .05$, # $p < .1$

All significance levels are two-tailed.

Hypothesis 2: Multiple Regression Analysis

Stepwise multiple regression analyses were performed using each of the coping and cognitive style subscales separately as the dependent (criterion) variable, and using the outcome summary variables as the independent (predictor) variables. This series of analyses allows determination of the effects that each of the coping and cognitive moderator variables have separately on outcome.

Ways Of Coping-Revised. Table 8 presents the multiple R, R Squared and significance level terms as well as the amount of total variance, step number and relationship for each independent variable entered. Greater anger and hostility was found to predict 10% of the variance of Confrontative Coping, while greater levels of vigor and activity as well as greater difficulties in recreation and pastimes predicted 17% of the variance in Self-Controlling strategies. Engaging in seeking social support was predicted by greater depression and dejection and decreased problems in alertness behavior (13% of variance accounted for). Greater mood disturbance, increased diffficulties in home management, and decreased confusion and physical concerns predicted 38% of the variance in escape avoidance coping strategies. Finally, 14% of the variance in positive reappraisal coping strategies

was predicted by increased levels of anger and hostility.

Insert Table 8 about here

Table 8

Prediction of Coping Strategies Using Psychosocial Outcome Following CHI

Variable	Mult R	R Squared	p	Profile Of Mood States							Sickness Impact Profile											
				TENSION/ANXIETY	DEPRESSION/DEJECTION	HOSTILITY	ANGER/IRRITABILITY	FATIGUE	CONFUSION/BEWILDERMENT	TENSION/DISCOMFORT	EMOTIONAL BEHAVIOR	BODY MOVEMENT	ALERTNESS/MENTAL ACTIVITY	MOBILITY	AMBULATION	WORK	RECREATION & PASTIMES	PHYSICAL DISABILITY	PSYCHOSOCIAL DISABILITY	SOCIAL INTERACTION	TOTAL
Confrontative Coping	0.32	0.10	<.019			10% (1)[+]																
Distancing	** NO VARIABLES ENTERED **																					
Self-Controlling	0.41	0.17	<.010				11% (2)[+]										5% (1)[+]					
Seeking Social Support	0.37	0.13	<.023	7% (1)[+]											7% (2)[-]							
Accepting Responsibility	** NO VARIABLES ENTERED **																					
Escape Avoidance	0.61	0.38	<.000						9% (2)[-]	20% (1)[+]			5% (4)[+]					4% (3)[-]				
Planful Problem Solving	** NO VARIABLES ENTERED **																					
Positive Reappraisal	0.37	0.14	<.006			14% (1)[+]																

Note. Rounded brackets ( ) following the variance accounted for by each predictor contain the step number that variable entered the equation. Square brackets [ ] indicate the relationship of that variable to a higher score on that scale, i.e., [+] indicates that the higher X, the higher Y; [-] indicates the higher X the lower Y, or vice versa.

Attributional Style. Table 9 presents similar statistics in stepwise multiple regression analyses which used ASQ subscales and composite scores as dependent variables. Internal attributions for negative events were predicted by decreased reported tension and anxiety, decreased difficulty in mobility, and greater confusion and bewilderment as well as overall concerns as measured by the SIP (43% of variance accounted for). Seven percent of the variance of global attributions for negative events were predicted by higher concerns with recreation and pastimes. Negative composite attributional style was predicted by decreased levels of overall physical difficulties, but greater levels of difficulty in ambulation and overall functioning as measured by the SIP.

Increased difficulty in work-related concerns appears to be a very important variable in predicting attributions for positive events, accounting for 10% of the variance in internal attributions, 6% of the variance in stable attributions, and 9% of the variance in global attributions. Increased tension and anxiety and decreased depression dejection accounted for the remaining 19% of 25% total variance accounted for in stable attributions for positive events, while decreased confusion and bewilderment and increased

difficulty in mobility accounted for the remaining 19% of 28% total variance accounted for in global attributions for positive events. The importance of work related concerns is also apparent when examining variables entered to predict composite positive attributional style. Increased work related concerns accounted for 12% of the variance in both hopeful composite attributional style and composite positive attibutional style.

Insert Table 9 about here

Table 9

Prediction of Attributional Style Using Psychosocial Outcome Following CHI

			Profile Of Mood States							Sickness Impact Profile										
				D /				C B	T D		&	M		A			R &			
			T A	E D	H	A	F	O E	O I	E B	B	A	M	M	A B		E	P D	P D	T
			E N	P E	A O	V C	A	N W	T S	M E	O M	N	O	R	L E		C P	H I	S I	O
			N X	R J	N S	I T	T	F I	A T	O H	D O	H A	B	U	E H	W	R A	Y M	Y M	T S
			S I	E E	G T	G I	I	U L	L U	T A	Y V	O G	I	L	R A	O	E S	S E	C E	A C
			I E	S C	E I	O V	G	S D	R	I V	E	M E	L	A	T V	R	A T	I N	H N	L O
			O T	S T	R L	R I	U	I E	M B	O I	C M	E M	I	T	N I	K	T I	C S	O S	R
			N Y	I I	/ I	/ T	E	O R	O N	N O	A E	E	T	I	E O		I M	A I	S I	S E
			/	O O	T	Y		N M	O C	A R	R N	N	Y	O	S R		O E	L O	O O	I
Variable	Mult R	R Squared	p		N N	Y		/ T	D E	L	E T	T		N	S		N S	N	C N	P
Positive Event Attributions																				
Internal	0.31	0.10	<.023												10% (1)[+]					
Stable	0.50	0.25	<.003	12% (1)[+]	7% (2)[-]										6% (3)[+]					
Global	0.52	0.28	<.001					10% (2)[-]				9% (3)[+]			9% (1)[+]					
Negative Event Attributions																				
Internal	0.66	0.43	<.000	6% (5)[-]				4% (6)[+]				9% (2)[-]						14% (1)[+]	10% (3)[+]	
Stable	** NO VARIABLES ENTERED **																			
Global	0.26	0.07	<.061														7% (1)[+]			
Composite Scores																				
Hopeless	** NO VARIABLES ENTERED **																			
Hopeful	0.35	0.12	<.011												12% (1)[+]					
Negative	0.57	0.34	<.000								7% (2)[-]		7% (3)[+]	9% (1)[+]				7% (4)[-]		4% (5)[+]
Positive	0.37	0.12	<.007												12% (1)[+]					
Positive-Negative	** NO VARIABLES ENTERED **																			

Note. Rounded brackets ( ) following the variance accounted for by each predictor contain the step number that variable entered the equation. Square brackets [ ] indicate the relationship of that variable to a higher score on that scale, i.e., [+] indicates that the higher X, the higher Y; [-] indicates the higher X the lower Y, or vice versa.

[1] The Psychosocial Dimension variable was removed on step 4 of the equation predicting Internal Attributional Style for Negative Events
[2] The Alertness Behavior variable was removed on step 6 of the equation predicting Composite Negative Attributional Style
[3] The Body Care & Movement variable was removed on step 7 of the equation predicting Composite Negative Attributional Style

Revised I/E Locus of Control. Stepwise multiple regression analyses were also conducted using the Revised I/E scales as dependent variables. Table 10 presents the relevant statistical data. Ten percent of the total variance in internal locus of control was predicted by decreased body care and movement concerns. Decreased fatigue and increased feelings of anger and hostility accounted for 13% of the variance of powerful others external locus of control. Finally, decreased fatigue and increased feelings of depression and dejection, as well as difficulty in emotional behavior accounted for 26% of the variance in chance external locus of control.

Insert Table 10 about here

Table 10

Prediction of Revised I/E Scores Using Psychosocial Outcome Following CHI

				Profile Of Mood States							Sickness Impact Profile										
					D /				C B	T D		&	M		A			R &			
				T A	E D	H	A	F	O E	O I	E B	B	A	M	M	A B		E	P D	P D	T
				E N	P E	A O	V C	A	N W	T S	M E	O M	N	O	B	L E		C P	H I	S I	O
				N X	R J	N S	I T	T	F I	A T	O H	D O	H A	B	U	E H	W	R A	Y M	Y M	T S
				S I	E E	G T	G I	I	U L	L U	T A	Y V	O G	I	L	R A	O	E S	S E	C E	A C
				I E	S C	E I	O V	G	S D	R	I V	E	M E	L	A	T V	R	A T	I N	H N	L O
				O T	S T	R L	R I	U	I E	M B	O I	C M	E M	I	T	N I	K	T I	C S	O S	R
				N Y	I I	/ I	/ T	E	O R	O N	N O	A E	E	T	I	E O		I M	A I	S I	S E
				/	O O	T	Y		N M	O C	A R	R N	N	Y	O	S R		O E	L O	O O	I
Variable	Mult R	R Squared	p		N N	Y			/ T	D E	L	E T	T		N	S		N S	N	C N	P
Internal	0.31	0.10	<.024												10% (1)[-]						
Powerful Others	0.36	0.13	<.029			7% (1)[+]		6% (2)[-]													
Chance	0.51	0.26	<.002		5% (3)[+]			5% (2)[-]				16% (1)[+]									

Note. Rounded brackets ( ) following the variance accounted for by each predictor contain the step number that variable entered the equation. Square brackets [ ] indicate the relationship of that variable to a higher score on that scale, i.e., [+] indicates that the higher X, the higher Y; [-] indicates the higher X the lower Y, or vice versa.

Multidimensional Health Locus of Control.

Finally, Table 11 presents the outcome of stepwise multiple regression analyses using MHLC subscales as dependent variables and outcome measures as predictors. Decreased fatigue accounted for 8% of the variance in internal health locus of control, while increased difficulties in home management accounted for 13% of the variance in powerful others external health locus of control. Increased anger and hostility and difficulties in emotional behavior as well as decreased physical concerns together accounted for 31% of the variance in chance external health locus of control.

Insert Table 11 about here

Table 11

Prediction of MHLC Scores Using Psychosocial Outcome Following CHI

				Profile Of Mood States							Sickness Impact Profile										
					D /				C B	T D		&	M		A			R &			
				T A	E D	H	A	F	O E	O I	E B	B	A	M	M	A B		E	P D	P D	T
				E N	P E	A O	V C	A	N W	T S	M E	O M	N	O	B	L E		C P	H I	S I	O
				N X	R J	N S	I T	T	F I	A T	O H	D O	H A	B	U	E H	W	R A	Y M	Y M	T S
				S I	E E	G T	G I	I	U L	L U	T A	Y V	O G	I	L	R A	O	E S	S E	C E	A C
				I E	S C	E I	O V	G	S D	R	I V	E	M E	L	A	T V	R	A T	I N	H N	L O
				O T	S T	R L	R I	U	I E	M B	O I	C M	E M	I	T	N I	K	T I	C S	O S	R
				N Y	I I	/ I	/ T	E	O R	O N	N O	A E	E	T	I	E O		I M	A I	S I	S E
				/	O O	T	Y		N M	O C	A R	R N	N	Y	O	S R		O E	L O	O O	I
Variable	Mult R	R Squared	p		N N	Y			/ T	D E	L	E T	T		N	S		N S	N	C N	P
Internal	0.28	0.08	<.043					8% (1)[-]													
Powerful Others	0.37	0.13	<.007										13% (1)[+]								
Chance	0.55	0.31	<.000			18% (1)[+]					5% (2)[+]									7% (3)[-]	

Note. Rounded brackets ( ) following the variance accounted for by each predictor contain the step number that variable entered the equation. Square brackets [ ] indicate the relationship of that variable to a higher score on that scale, i.e., [+] indicates that the higher X, the higher Y; [-] indicates the higher X the lower Y, or vice versa.

Hypothesis 2:Cluster Analysis

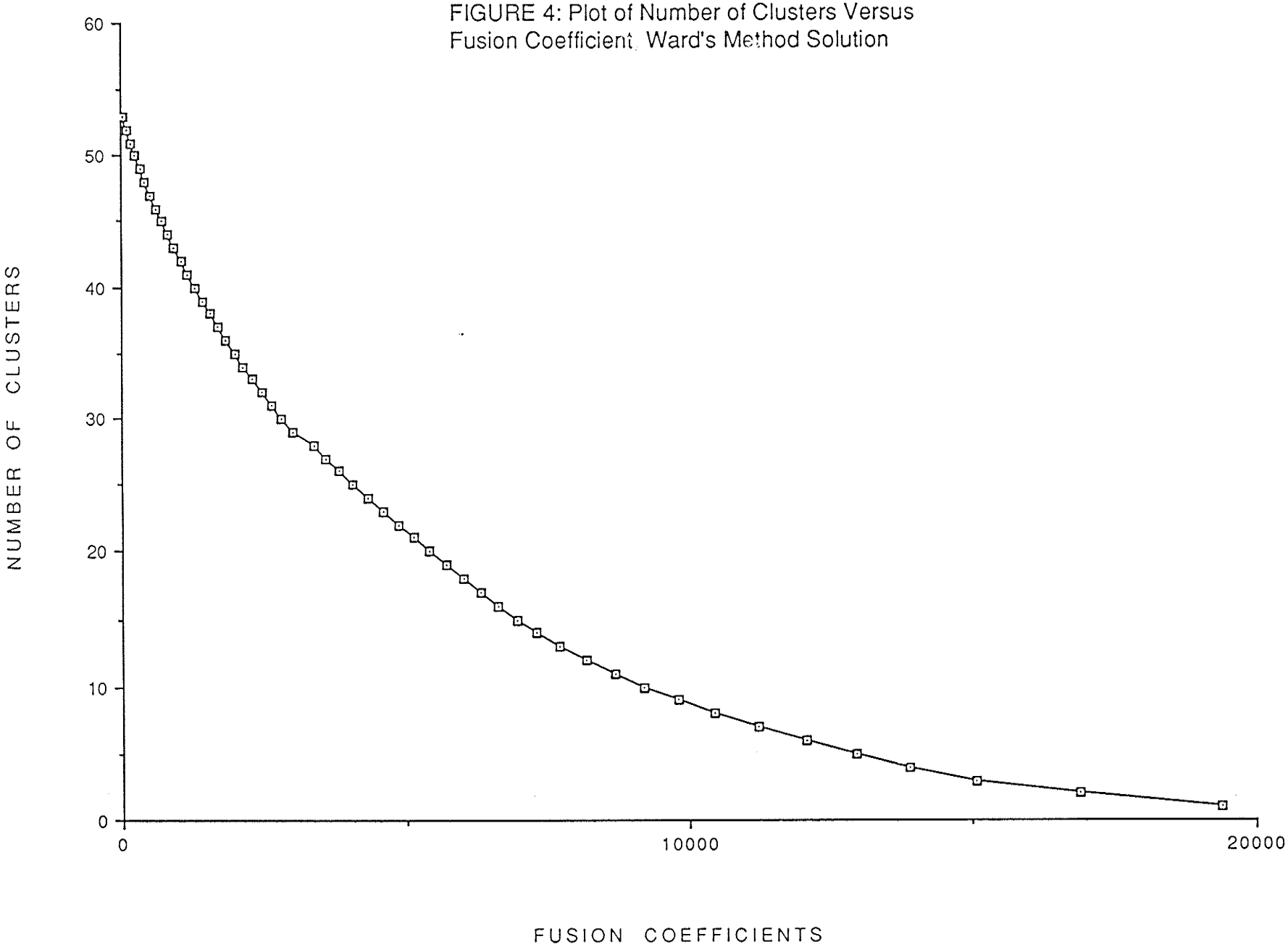
The final set of analyses reported in this paper is a cluster analysis performed using clinical scale WOC-R scores, the Internal, Powerful Others, and Chance subscale scores of the Revised I-E scale and MHLC as well as the composite scores from the ASQ as the basis for the analysis. These analyses will allow investigation of how cognitive beliefs and coping strategies together interact, and how this may be related to psychosocial outcomes following CHI. In addition, this set of analyses will investigate whether the severity of the injury, the age of the patient, or the number of months post injury is related to differing patterns of coping, attributions and locus of control.

Clustering Methodology. Using studies conducted by Frank, Umlauf, Wonderlich, Askansazi, Bucklew and Elliott (1987) and Moore, Stambrook, and Peters (1988) as a model, Ward's method of minimum-variance clustering and the squared Euclidian distance as the metric was performed on the aforementioned cluster variables using the SPSSx statistical analysis program (version 2.1). Subjects were deleted from this series of analyses on a case-wise basis if they had missing data The number of clusters was determined by using strategies reported by Hair, Rolph, and Traitman

(1987). This involved initially performing cluster analyses resulting in two to six cluster solutions, then inspecting coefficients describing inter-cluster distance, looking for a sudden jump, and inspecting the clinical relevance of the clusters themselves to arrive at the optimal number of clusters. The sudden jump in coefficents was observed between solutions of 3 and 4 clusters (see Figure 4), and following inspection of the clusters themselves, it was decided that a 4 cluster solution supplied the most clinically relevant information.

Insert Figure 4 about here

FIGURE 4: Plot of Number of Clusters Versus Fusion Coefficient, Ward's Method Solution



The cluster membership, with means and standard deviations for all clustered variables is reported in Table 12. This table also includes differences between clusters as determined by Tukey's Honestly Significant Difference multiple comparison procedure, with family-wise alpha set at .05.

Insert Table 12 about here

Table 12

Cluster Analysis: Coping Strategies and Belief Structure - Variables Included In The Cluster Analysis

Variable	Cluster 1 High Coping High Internal LOC Positive AS (N=9)		Cluster 2 Low Coping Low Overall LOC Positive AS (N=11)		Cluster 3 Medium Coping Medium Overall LOC Negative AS (N=21)		Cluster 4 High Coping High External LOC Positive AS (N=13)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Ways Of Coping- Revised								
Confrontative Coping	6.22	2.33	2.82	2.36^{4}	4.96	2.51	7.46	4.35
Distancing	8.78	3.46	4.64	2.69^{14}	6.59	3.47	8.31	2.87
Self-Controlling	13.44	3.64^{34}	4.81	3.55^{134}	8.64	2.56	9.62	3.97
Seeking Social Support	10.89	2.94^{23}	4.73	2.49	7.59	2.87	7.84	3.63
Accepting Responsibility	5.78	3.11	1.55	1.91^{134}	4.59	2.52	6.08	4.27
Escape Avoidance	7.44	3.94	2.36	2.06^{34}	10.23	5.09	10.54	5.24
Planful Problem Solving	10.89	3.02^{23}	5.63	3.50	7.05	2.54	8.15	4.52
Positive Reappraisal	16.00	2.35^{234}	6.91	4.11	7.72	4.30	8.23	3.56
Attributional Style Questionnaire - Composite Scores								
Hopeless	8.92	1.37	6.71	2.15	8.72	1.63^{2}	8.03	2.70
Hopeful	11.65	1.71	9.97	1.69	10.09	1.45	11.63	2.51
Negative	13.70	1.82	10.53	2.62^{31}	13.55	2.47	11.61	2.77
Positive	17.16	2.59	15.42	2.43	15.25	1.91	17.36	3.97
Positive-Negative	3.45	2.81	4.89	4.13	1.71	2.33^{24}	5.75	3.60
Revised I-E Scale								
Internal	40.33	4.95	37.91	4.95	38.91	4.31	36.23	4.68
Powerful Others	20.78	6.12	22.09	5.99	25.86	4.12	28.46	6.91^{12}
Chance	20.22	7.29	21.36	5.53	24.55	3.51	31.77	4.26^{123}
Multidimensional Health Locus Of Control Scale								
Internal	29.06	4.85	24.73	4.49	25.95	5.18	26.46	3.31
Powerful Others	17.00	5.67	18.41	6.76	18.19	4.47	25.61	4.66^{123}
Chance	10.94	3.22	15.95	4.91	18.59	4.25^{1}	22.85	4.08^{123}

Note. Superscripts indicate significantly different inter-cluster means using Tukey's-HSD procedure ($p < .05$). Subjects were deleted from this analysis on a list-wise basis.

Cluster 1 was composed of 9 subjects who used WOC-R coping strategies to a high degree, had relatively high internal LOC compared to external LOC, and had positive attributional style. These subjects could be described as persons who dealt with stresses actively and believed in the effectiveness of their efforts. Cluster 2 was composed of 11 subjects who made little use of WOC-R coping strategies, reported low levels of LOC beliefs overall, and also displayed low negative attributional style. These subjects seem to fit the description of the "buffering" coping style (Taylor, 1983). These subjects appear to be making low use of coping styles because they don't perceive that they are under severe stress. Cluster 3 was composed of subjects who used levels of WOC-R coping strategies and locus of control beliefs in between the extremes represented by clusters 1 and 4 on the high end and cluster 2 on the low end. These 21 subjects also displayed high negative attributional styles. These subjects appear to be the patients who have adopted learned helplessness, in view of the ASQ scores, but interestingly, are still engaging in coping behaviors. The combination of high negative attributional style while still engaging in coping behaviors appears to be highly inconsistent. Finally, the 13 subjects who made up cluster 4 used WOC-R coping strategies to a high extent, had high external LOC beliefs and had

relatively positive attributional styles. These subjects also have inconsistent patterns of coping and beliefs. Perhaps these subjects are best described as people who try very hard to deal with the fallout from their head injuries, but do not believe in themselves.

Validation Analysis. MANOVA's were performed to determine differences between the cluster groupings. The means and standard deviations for variables used in this three part validation analysis as well as intercluster differences found are provided in Table 13.

Insert Table 13 about here

Table 13

Cluster Analysis: Coping Strategies and Belief Structure - Validation Analysis: Relationship to Long-Term Outcome

Variable	Cluster 1 High Coping High Internal LOC Positive AS (N=9) Mean	S.D.	Cluster 2 Low Coping Low Overall LOC Positive AS (N=11) Mean	S.D.	Cluster 3 Medium Coping Medium Overall LOC Negative AS (N=21) Mean	S.D.	Cluster 4 High Coping High External LOC Positive AS (N=13) Mean	S.D.
Medical/Demographic Variables								
Glasgow Coma Scale On Admission	9.57	4.86	11.00	4.04	11.20	3.69	13.50	2.64
Length of Coma (GCS < 8; days)	4.14	4.71	2.29	3.09	1.70	2.72	0.80	0.42
Length of PTA (GCS < 15; days)	14.00	19.95	10.00	12.21	10.20	20.43	1.30	1.06
Age (at time of injury)	34.57	18.38	42.00	13.78	33.65	15.52	40.80	16.39
Months Post-Injury	64.71	29.27	74.43	28.56	64.10	22.87	74.40	13.66
Outcome Variables Profile Of Mood States								
Tension/Anxiety	12.00	3.39	12.46	5.41	17.00	5.36 [1 2]	15.77	4.48
Depression/Dejection	19.33	4.36	22.09	11.89	29.91	13.08 [1 2]	26.15	8.32
Anger/Hostility	15.67	2.24	18.00	8.60	23.71	8.91 [1 2]	22.69	5.04 [1]
Vigor/Activity	25.79	4.27	24.27	4.78	23.81	6.47	21.85	6.47
Fatigue	16.79	4.84	13.18	6.95	17.81	7.45	14.92	6.63
Confusion/Bewilderment	12.57	1.67	12.82	5.60	17.00	5.32 [1 2]	15.69	5.47
Total Mood Disturbance	50.56	8.35	54.27	39.69	82.10	41.84 [1 2]	75.69	29.41
Sickness Impact Profile								
Sleep and Rest	11.31	12.76	17.29	27.10	21.04	24.17	26.75	27.75
Emotional Behavior	3.13	6.61	3.56	11.81	12.04	14.34	20.02	17.60 [1 2]
Body Care and Movement	0.68	1.14	3.76	9.34	3.39	5.71	10.35	21.08
Home Management	9.20	11.46	5.54	18.36	13.17	21.07	16.69	21.49
Mobility	1.66	3.40	4.63	15.35	5.11	11.86	12.36	17.08
Social Interaction	12.34	11.89	5.96	16.07	23.38	24.06 [2]	14.65	15.22
Ambulation	5.87	8.46	4.68	9.98	5.76	13.04	11.06	17.12
Alertness Behavior	8.37	13.04	8.70	21.24	30.72	30.58 [1 2]	23.82	32.93
Comunication	6.59	14.06	4.93	16.34	16.49	20.39	11.05	16.66
Work	24.74	29.72	18.20	27.45	20.77	28.14	23.58	26.93
Recreation & Pastimes	28.45	16.87	9.07	16.85	25.38	23.98 [2]	20.92	26.01
Eating	0.00	0.00	1.57	2.71	1.31	2.33	1.04	2.04
Physical Dimension	2.10	2.95	4.15	9.79	4.29	6.68	7.92	10.32
Psychosocial Dimension	8.58	7.88	5.86	16.28	21.39	19.44 [2]	16.70	16.74
Total SIP Score	7.54	4.12	6.17	13.47	13.49	12.20	13.62	12.34

Note. Superscripts indicate significantly different inter-cluster means using LSD procedure ($p < .05$).

The first MANOVA looked for inter-cluster differences in demographic and injury severity variables, specifically age, GCS on admission, length of PTA and coma, and months post injury. This MANOVA was nonsignificant (Hotelling's T^2 = 0.427, Equivalent Multivariate F (15,104) = 0.987, p < .474), as were all univariate F-tests (p's > .135). Because of the a priori hypothesis advanced, and the exploratory nature of this research, Tukey's-HSD post-hoc tests were also performed, but failed to find any intercluster differences for these accident related and demographic variables.

A second multivariate ANOVA used emotional outcome variables measured by the POMS as the dependent variables. This MANOVA approached significance (Hotelling's T^2 = 0.785, Equivalent Multivariate F (21,128) = 1.595, p < .060). Significant intercluster differences were found in univariate F-tests for the Tension/Anxiety (F(3,50) = 3.39, p < .025), and Anger/Hostility (F(3,50) = 3.41, p < .024) subscales, while results approached significance for the Depression/Dejection (F(3,50) = 2.53, p < .068), Confusion/Bewilderment (F(3,50) = 2.59, p < .063), and Total Mood Disturbance scales (F(3,50) = 2.60, p < .063).

The use of Tukey's-HSD post-hoc tests did not fully determine all of the intercluster differences suggested by the F-tests, and so the more liberal Least Significant Difference procedure was used to find the intercluster differences. Cluster 3 subjects significantly reported more tension/anxiety, depression/dejection, anger/hostility,, confusion/bewilderment, and total mood disturbance compared to cluster 1 and 2 subjects. Cluster 4 subjects reported more anger/hostility compared to cluster 1 subjects.

The final multivariate ANOVA used physical/psychosocial outcome as measured by the SIP as the dependent variables. The multivariate MANOVA was nonsignificant (Hotelling's $T^2 = 1.679$, Equivalent Multivariate F $(45,101) = 1.256$, $p < .173$). Univariate F-tests found significant intercluster differences in Emotional Behavior ($F(3,49) = 3.877$, $p < .014$), and results approached significance for Alertness Behavior ($F(3,49) = 2.267$, $p < .092$) and the Psychosocial Dimension summary scale ($F(3,49) = 2.552$, $p < .066$).

Least Significant Difference post-hoc tests were used to maintain continuity with similar analyses performed on POMS subscales. Cluster 4 subjects reported significantly more emotional behavior difficulties compared with cluster 1 and 2 subjects.

Cluster 3 subjects reported significantly more difficulties in social interaction, alertness behavior, recreation and pastimes, and overall psychosocial functioning compared with cluster 2 subjects. Cluster 3 subjects also reported more difficulties in alertness behavior compared to cluster 1 subjects.

Overall, these results suggest that the combination of coping strategies, locus of control beliefs and attributional styles used by cluster 3 and to a lesser extent, cluster 4 subjects are associated with poorer psychosocial outcome. In addition, these clusters of coping strategies and belief structures are not related to age, number of months post injury, or severity of injury.

DISCUSSION

Overall, the results reported in this paper are consistent with hypothesis 2, but not with hypothesis 1. The major implication of these findings is that although belief structure does appear to contribute to the outcome from CHI, belief structure cannot be simply predicted from injury severity. Further research should attempt to find predictors of belief structure.

Hypothesis 1

The goal of this set of analyses was simply to determine whether belief structure was related to the severity of the initial injury. It was hypothesized that patients who sustained severe head injuries would have life experiences, due in large measure to the sequelae of CHI, that would teach them that they had little control over their life situation. This would lead to the adoption of a "helpless" attributional style, and to higher levels of external LOC beliefs. The current results do not support the hypothesis that all severely head injured patients have greater "helpless" attributional style and external LOC as compared to the less severely injured. The question

that follows from this statement is then, "Is the model presented also invalid?". Although this model obviously does not apply to everyone who sustains a head injury, I am relucant to suggest that the model is completely invalid, since results also reported in this paper suggest that belief structures do impact on the long-term outcome from CHI. Perhaps premorbid personality structures in the individual CHI patient "immunize" some patients against the adoption of negative belief structures. Further research should focus on these issues, in an attempt to identify variables that can determine those at risk for developing negative belief structures. I would suggest that the model presented is valid for those persons who do have negative belief structures following head injury. The results here tell us, however, that the adoption of negative belief structures is not solely a product of the severity of head injury, but occur as a result of, or more likely in combination with other, as yet undetermined factors.

Hypothesis 2

The goal of this set of analyses was to determine how coping behaviors and belief structures were related to long-term outcome. It was hypothesized that internal LOC and positive AS would be associated with

better outcome. Overall, this hypothesis was validated, although some results, particularily concerning attributional style, are not completely clear.

Univariate correlational analyses identified coping behaviors and belief structures that were associated with good and bad outcomes. It appears that patients who use positive reappraisal as a coping strategy, have a greater positive versus negative attributional style, and have high internal LOC beliefs, are likely to have good long-term outcomes. However, patients who use confrontative coping and escape avoidance as coping behaviors, attribute negative events to internal and global factors and have high external LOC beliefs are likely to have poor long-term outcome. An unexpected finding in this set of analyses was that internal and stable attributions for positive events was related to primarily greater physical disturbance. It is possible that for CHI patients who, after this length of time post-injury, have primarily physical complaints, dealing with these physical problems does not necessarily lead to the adoption of a negative attributional style. This speculation deserves further research.

The stepwise multiple regression analyses were designed to further investigate the specific

relationships between coping strategies and belief structures and outcome. In the analyses involving coping behaviors, 10 to 38 percent of the variance was accounted for on five of the eight coping behaviors measured by the WOC-R. Of special importance because of their relationship to outcome were the confrontative coping, escape avoidance and positive reappraisal coping strategies. Escape avoidance behaviors was related to high levels of mood disturbance and difficulties in home management, and low physical difficulties and low levels of confusion/bewilderment. This suggests that persons who are well aware of emotional difficulties and have few physical problems tend to try to deny or blunt this awareness. This coping behavior appears to be ineffective. Surprisingly, both a positive reappraisal (a coping behavior associated with good outcome) and confrontative coping (a coping behavior associated with poor outcome) were predicted by higher levels of anger/hostility. It appears that the motivating factor of frustration is behind coping behaviors which can work to the good or bad of the person. Again, further research should strive to determine how frustration can be harnessed as a positive influence.

Stepwise regressions on ASQ scores also tend to support hypothesis 2. The analyses focusing on

attributional style for negative events seem to suggest that "helpless" people who have given up use higher levels of negative attributional style. Internal attributions for negative events were predicted by low levels of tension/anxiety, and mobility, and high levels of confusion/bewilderment and overall disturbance. This constellation of factors seems to fit with the notion of a helpless person. Another robust, but surprising finding is the importance of work related concerns in the prediction of positive attributional style. High levels of work related concerns entered as predictors of levels of internal, global and stable attributions for positive events as well as positive and hopeful compositive scores. Perhaps, for people who have trouble related to work concerns, an increased positive attributional style serves as a shield against negative self-attributions concerning work.

Finally, the stepwise regressions using LOC subscales as dependent variables also yielded results consistent with Hypothesis 2. High levels of internal LOC was predicted by low levels of fatigue for the MHLC and low levels of body care and movement concerns for the Revised I/E scale. High powerful others LOC was predicted by high levels of home management concerns for the MHLC and high levels of anger/hostility and low

levels of fatigue for the Revised I/E scale. Again, the double-edged sword of frustration is apparent. High chance LOC was predicted by high levels of anger/hostility and emotional disturbance for the MHLC, and high levels of depression/dejection, and emotional disturbance, along with low levels of anger/hostility for the Revised I/E scale. Again, for this scale we get a picture of a frustrated, helpless, and defeated person who has high levels of chance LOC.

Finally, and perhaps most interesting, were the analyses involving cluster analysis using all of the coping and belief structure variables to determine first how these variables are associated, and second, how they relate to long-term outcome. Two clusters appear to be associated with good outcome and two with poor outcome. Among the clusters associated with good outcome were Cluster 1, a cluster in which subjects used high levels of coping behaviors, had high internal LOC and had moderately positive AS, and Cluster 2, a cluster in which subjects used low levels of coping, had low overall LOC beliefs, but also had quite low negative attributional style. Overall, these clusters appear quite similar to two clusters in Moore, Stambrook & Peters (1988) that were also associated with good outcome. However, here we now also know about the patient's belief structure and how these are

related to outcome. These clusters also fit in large measure with predictions made in Hypothesis 2. The two clusters associated with poor outcome appear to be using an inconsistent means of dealing with their illness, and these strategies are ineffective. Cluster 4 was characterized by subjects who used high levels of coping behaviors but had high external LOC beliefs, and relatively high attributional style. This constellation of behaviors and beliefs appear quite inconsistent - suggesting that these subjects try really hard to do something about their life situation, but don't believe in themselves. Cluster 3, the cluster associated with the worst long-term outcome appear to have adopted learned helplessness while engaging in moderate levels of coping behaviors and having neither internal nor external LOC beliefs, Again, these results support Hypothesis 2.

When we consider that the majority of subjects fell into clusters 3 and 4 in the cluster analysis, using coping strategies and having belief structures associated with poor outcome, the importance of the current results is apparent. Although this research was unsuccessful in determining antecedents for belief structures and coping styles associated with poor long-term outcome, it did identify that these variables are important moderators and predictors of outcome.

Three questions arise from the current results. First, why do some CHI patients use ineffective coping behaviors and adopt damaging belief structures? Second, what are the implications of these results for clinical intervention? Thirdly, how generalizable are these results? These important questions will be addressed in the remainder of this paper.

Clearly, determination of why CHI patients appear to adopt non-functional coping behaviors and beliefs in an attempt to deal with the sequalae of their injuries is a subject for further research. It is also clear that personality factors may play a role in the adoption of coping strategies and belief structures. Seligman's (1975) review of Brady's (1958) and Weiss' (1968; 1970; 1971) studies of the "executive monkey" research paradigm seem particularly applicable. Seligman suggests that people who try harder to cope with life may also be more predisposed to develop physical and/or psychological pathology. The results of the executive monkey research indicate that animals who are more afraid or emotional are more reactive to shock, and as a result produce more coping behaviors while developing more ulcers due to their "personality". This may also appear to be applicable to the case of the head injured patient whose premorbid personality predisposes him (or her) to be more

reactive to the consequences of the injury, while at the same time, reactions to the sequelae of the injury are more intense. This concommitant series of events would appear to be linked to the adoption of both ineffective coping strategies, and to the development of negative AS and external LOC, which have been demonstrated in the current paper to be linked to poorer outcome.

What implications do these results have for intervention? Having demonstrated the applicability of the AS as a moderator of long-term outcome following CHI, immunization programs as discussed by Seligman (1975) and Dweck and Repucci (1973), might be applicable to CHI patients undergoing rehabilitation therapy. More recently, similar intervention stratgies have been used with suicidal patients (Rosenthal, 1986), with children (Nolen-Hoeksema, Girgus & Seligman, 1986), with unemployed persons (Abbott, 1984; Bowman, 1984), and with geriatric nursing home residents (Avorn & Langer, 1982). Kessell, Resnick and Blum (1985) describe a health-promotion program called Adventure, Inc. which has successfully used strategies to help chronically ill or disabled adolescents in part, to achieve a sense of mastery and achieve a positive body image. Fortunately for the head injury rehabiliation team, it appears that a number of successful programs are already in place for adoption

(following adaptation to the concerns and beliefs of the CHI patient) with head injured patients. Such intervention programs must be research based and are clearly an area for further study.

What of the CHI patient who does not recieve attribution retraining therapy in rehabilitation, but has external LOC beliefs and negative AS? Perhaps cognitive therapy (Beck 1967, 1970; Hollon & Beck, 1979; Piasecki & Hollon, 1987) with it's special emphasis on modification of negative beliefs and/or dysfunctional information processing may be effective in helping CHI patients change LOC and AS beliefs associated with poor outcome. Beck & Emery (1985) emphasize the importance of hypothesis testing in cognitive therapy, in which the client is asked to write out predictions and later to examine the accuracy of these predicitions. For example, the CHI patient might suggest that "I can't remember anything anymore" and, for homework, might be asked to keep a record of each time his memory served him or failed him during the week. It can be seen how such homework would serve to break down negative attributions and external LOC beliefs.

It is also critical that the CHI patient's family be involved in these interventions. Consistent intervention techniques are essential for the CHI

patient to really understand and then assimilate positive belief structures. In addition, family members will also benefit, having a more self-sufficient and well adjusted member through this process.

Finally, the question of the generalizability and utility of these results must be addressed. Limitations in the design of the experiment do constrain the weight clinicians should attach to these results. Firstly, the lack of a control group and the use of a retrospective design limits the extent to which these results can be applied. Although it appears that the coping patterns identified are common in the adaption to head injury and spinal cord injury (Frank et al., 1987), it is unclear whether these coping patterns are "normal", that is, are also used by people dealing with "everyday" stressors, or come about as a result of life-threatening and/or chronic illness. Further research needs to address this question.

Secondly, the cluster analytic techniques used in the current research, do tend to produce certain types of clusters - thereby limiting the generalizability of the results. Ward's method produces clusters which have relatively equal cluster sizes, and tends to separate clusters on the basis of the overall size of the variables (e.g., a low, medium and high cluster;

Aldenderfer & Blashfield, 1984; Hair, Anderson & Tatham, 1987). Use of a K-means procedure would create clusters on the basis of the similarity of the profile (somewhat like MMPI profiles) of scores, and would result in completely different cluster solutions. In addition, the choice of the measure of similarity can also effect cluster solutions, particularly when working with data with different metrics as was the case in the current study. Although the use of the squared euclidean distance does normalize distances, and is the similarity measure of choice in Ward's method, other similarity measures such as Malalanobis distance also adjust for intercorrelations among the variables (Hair, Anderson & Tatham, 1987). In the present study, these correlations, although small, do exist. However, in the interest of maintaining compatibility to previous research, and using the similarity measure of choice for Ward's method, the squared euclidean measure was used in the current study. To sum up, there are a number of valid ways of performing cluster analysis on the present data, and the reader should be aware that the results reported are only one way of looking at this data.

Finally, the utility of these results in planning interventions may be small. It appears that the amount of variance in the outcome measures accounted for by

belief measures in the correlational analyses although significant, is rather small. It remains to be seen whether specifically intervening to change cognitive beliefs would be efficient, although it appears that these variables should be considered in the planning of holistic and comprehensive rehabiliation strategy.

In summary, this research has served to highlight the importance of cognitive factors in recovery from CHI. It is hoped that the information contained in this project will help health care professionals in their task to assist head injured persons attain optimal quality of life, and that the research this project will inspire will continue to expand our knowledge concerning the factors which predict and moderate the recovery process following CHI.

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APPENDIX A

The Attributional Style Questionniare

DIRECTIONS

1) Read each situation below and vividly imagine it happening to you.

2) Decide what you believe would be the major cause of the situation if it happened to you.

3) Write this cause in the blank provided.

4) Answer three questions about the cause, circling one response per question.

5) Go on to the next question.

GO ON TO THE NEXT PAGE

FOR THE FIRST SITUATION

Situation #1. You meet a friend who compliments you on your appearance.

a) Write down one major cause.

_____

b) Is the cause of your friend's compliment due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

c) In the future when you are with your friend, will this cause again be present?

Will never again be present 1 2 3 4 5 6 7 Will always be present

d) Is the cause something that just affects interacting with friends or does it also influence other areas of your life ?

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #2. You have been looking for a job unsuccessfully for some time.

a) Write down one major cause.

_____

b) Is the cause of your unsuccessful job search due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

c) In the future when looking for a job, will this cause again be present?

Will never again be present	1	2	3	4	5	6	7	Will always be present

d) Is the cause something that just affects looking for a job or does it also influence other areas of your life ?

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #3 You become very rich.

a) Write down one major cause.

_____

b) Is the cause of your becoming rich due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

c) In your financial future, will this cause again be present?

Will never again be present 1 2 3 4 5 6 7 Will always be present

d) Is the cause something that just affects obtaining money or does it also influence other areas of your life ?

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #4 A friend comes to you with a problem and you don't try to help them.

a) Write down one major cause.

_____

b) Is the cause of your not helping your friend due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

c) In the future when a friend comes to you with a problem, will this cause again be present?

Will never again be present 1 2 3 4 5 6 7 Will always be present

d) Is the cause something that just affects what happens when a friend comes to you with a problem or does it also influence other areas of your life ?

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #5. You give an important talk in front of a group and the audience reacts negatively.

a) Write down one major cause.

_____

b) Is the cause of the audience reacting negatively due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

c) In the future when giving talks, will this cause again be present?

Will never again be present	1	2	3	4	5	6	7	Will always be present

d) Is the cause something that just influences giving talks or does it also influence other areas of your life ?

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #6. You do a project which is highly praised.

a) Write down one major cause.

_____

b) Is the cause of being praised due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

c) In the future when doing a project, will this cause again be present?

Will never again be present 1 2 3 4 5 6 7 Will always be present

d) Is the cause something that just affects doing projects or does it also influence other areas of your life ?

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #7. You meet a friend who acts hostilely towards you.

a) Write down one major cause.

_____

b) Is the cause of your friend acting hostile due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

c) In the future when interacting with friends, will this cause again be present?

Will never again be present	1	2	3	4	5	6	7	Will always be present

d) Is the cause something that just influences interacting with friends or does it also influence other areas of your life ?

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #8. You can't get all the work done that others expect of you.

a) Write down one major cause.

_____

b) Is the cause of your not getting the work done due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

c) In the future when doing the work that others expect, will this cause again be present?

Will never again be present 1 2 3 4 5 6 7 Will always be present

d) Is the cause something that just affects doing work that others expect or does it also influence other areas of your life ?

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #9. Your spouse (boyfriend/girlfriend) has been treating you more lovingly.

a) Write down one major cause.

_____

b) Is the cause of your spouse (boyfriend/girlfriend) treating you more lovingly due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

c) In the future interactions with your spouse (boyfriend/girlfriend), will this cause again be present?

Will never again be present 1 2 3 4 5 6 7 Will always be present

d) Is the cause something that just affects how your spouse (boyfriend/girlfriend) treats you or does it also influence other areas of your life ?

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #10. You apply for a position that you want very badly (e.g., an important job, graduate school admission, etc.) and you get it.

a) Write down one major cause.

_____

b) Is the cause of your getting the position due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances	1	2	3	4	5	6	7	Totally due to me

c) In the future when applying for a position, will this cause again be present?

Will never again be present	1	2	3	4	5	6	7	Will always be present

d) Is the cause something that just affects applying for a position or does it also influence other areas of your life ?

Influences just this particular situation	1	2	3	4	5	6	7	Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #11. You go out on a date and it goes badly.

a) Write down one major cause.

_____

b) Is the cause of the date going badly due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

c) In the future when dating, will this cause again be present?

Will never again be present 1 2 3 4 5 6 7 Will always be present

d) Is the cause something that just affects dating or does it also influence other areas of your life ?

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

GO ON TO THE NEXT PAGE

Situation #12. You get a raise.

a) Write down one major cause.

_____

b) Is the cause of your getting a raise due to something about you or something about other people or circumstances ?

Totally due to other people or circumstances 1 2 3 4 5 6 7 Totally due to me

c) In the future on your job, will this cause again be present?

Will never again be present 1 2 3 4 5 6 7 Will always be present

d) Is the cause something that just affects getting a raise or does it also influence other areas of your life ?

Influences just this particular situation 1 2 3 4 5 6 7 Influences all situations in my life

GO ON TO THE NEXT QUESTIONNAIRE

APPENDIX B

Revised Internal-External Locus of Control Scale

Questionnaire 2

Directions. This questionnaire is designed to assess how you feel who or what is responsible for things that happen to you in your life in general. Please circle the reponse that describes the extent to which you feel each statement describes your feelings.

(-3) - Strongly disagree

(-2) - Disagree somewhat

(-1) - Slightly disagree

(+1) - Slightly agree

(+2) - Agree somewhat

(+3) - Strongly agree

1) Whether or not I get to be a leader depends mostly on my ability -3 -2 -1 +1 +2 +3

2) To a great extent my life is controlled by accidental happenings -3 -2 -1 +1 +2 +3

3) I feel like what happens in my life is mostly determined by powerful people -3 -2 -1 +1 +2 +3

4) Whether or not I get into a car accident depends mostly on how good a driver I am -3 -2 -1 +1 +2 +3

5) When I make plans, I am almost certain to make them work -3 -2 -1 +1 +2 +3

6) Often there is no chance of protecting my personal interest from bad luck happenings -3 -2 -1 +1 +2 +3

7) When I get what I want, it's usually because I'm lucky -3 -2 -1 +1 +2 +3

8) Although I might have good ability, I will not be given leadership responsibility without appealing to those in positions of power -3 -2 -1 +1 +2 +3

9) How many friends I have depends on how nice a person I am -3 -2 -1 +1 +2 +3

10) I have often found that what is going to happen will happen -3 -2 -1 +1 +2 +3

11) My life is chiefly controlled by powerful others -3 -2 -1 +1 +2 +3

12) Whether or not I get into a car accident is mostly a matter of luck -3 -2 -1 +1 +2 +3

13) People like myself have very little chance of protecting our personal interests when they conflict with those of strong pressure groups -3 -2 -1 +1 +2 +3

14) It's not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune -3 -2 -1 +1 +2 +3

15) Getting what I want requires pleasing those people above me -3 -2 -1 +1 +2 +3

16) Whether or not I get to be a leader depends on whether I'm lucky enough to be in the right place at the right time -3 -2 -1 +1 +2 +3

17) If important people were to decide they didn't like me, I probably wouldn't make many friends -3 -2 -1 +1 +2 +3

18) I can pretty much determine what will happen in my life -3 -2 -1 +1 +2 +3

19) I am usually able to protect my personal interests -3 -2 -1 +1 +2 +3

20) Whether or not I get into a car accident depends mostly on the other driver -3 -2 -1 +1 +2 +3

21) When I get what I want, it's usually because I worked hard for it -3 -2 -1 +1 +2 +3

22) In order to have my plans work, I make sure that they fit in with the desires of people who have power over me -3 -2 -1 +1 +2 +3

23) My life is determined by my own actions -3 -2 -1 +1 +2 +3

24) It's chiefly a matter of fate whether or not I have a few friends or many friends -3 -2 -1 +1 +2 +3

GO ON TO THE NEXT QUESTIONNAIRE

APPENDIX C

The Multidimensional Health Locus of Control Scale

Questionnaire 3

Directions. This questionnaire is designed to assess how you feel who or what is responsible for illness and health in your life. Please circle the reponse that describes the extent to which you feel each statement describes your feelings.

(-3) - Strongly disagree

(-2) - Disagree somewhat

(-1) - Slightly disagree

(+1) - Slightly agree

(+2) - Agree somewhat

(+3) - Strongly agree

1) If I get sick, it is my own behavior which determines how soon I get well again

-3 -2 -1 +1 +2 +3

2) Following doctor's orders to the letter is the best way for me to stay healthy

-3 -2 -1 +1 +2 +3

3) No matter what I do, if I am going to get sick, I will get sick

-3 -2 -1 +1 +2 +3

4) I can pretty much stay healthy by taking good care of myself

-3 -2 -1 +1 +2 +3

5) Having regular contact with my physician is the best way for me to avoid illness

-3 -2 -1 +1 +2 +3

6) When I become ill, it's a matter of fate

-3 -2 -1 +1 +2 +3

7) Most things that affect my health happen to me by accident

-3 -2 -1 +1 +2 +3

8) Even when I take care of myself, it's easy to get sick

-3 -2 -1 +1 +2 +3

9) Whenever I don't feel well, I should consult a medically trained professional

-3 -2 -1 +1 +2 +3

10) The type of care I recieve from other people is what is responsible for how well I recover from an illness

-3 -2 -1 +1 +2 +3

11) I am in control of my health

-3 -2 -1 +1 +2 +3

12) When I feel ill, I know it is because I have not been taking care of myself properly

-3 -2 -1 +1 +2 +3

13) My family has a lot to do with my becoming sick or staying healthy

-3 -2 -1 +1 +2 +3

14) My physical well-being depends on how well I take care of myself

-3 -2 -1 +1 +2 +3

15) When I get sick I am to blame

-3 -2 -1 +1 +2 +3

16) When I stay healthy, I'm just plain lucky

-3 -2 -1 +1 +2 +3

17) Luck plays a big part in determining how soon I will recover from an illness

-3 -2 -1 +1 +2 +3

18) Health professionals keep me healthy

-3 -2 -1 +1 +2 +3

19) Health professionals control my health

-3 -2 -1 +1 +2 +3

20) When I am sick, I just have to let nature run its course

-3 -2 -1 +1 +2 +3

21) My good health is largely a matter of good fortune

-3 -2 -1 +1 +2 +3

22) Whatever goes wrong with my health is my own fault

-3 -2 -1 +1 +2 +3

23) The main thing which affects my health is what I myself do

-3 -2 -1 +1 +2 +3

24) Other people play a big part in whether I stay healthy or become sick

-3 -2 -1 +1 +2 +3

25) If I take care of myself, I can avoid illness

-3 -2 -1 +1 +2 +3

26) I am directly responsible for my health

-3 -2 -1 +1 +2 +3

27) When I recover from an illness, it's because other people (for example, doctors, nurses, family, friends) have been taking good care of me

-3 -2 -1 +1 +2 +3

28) I can only maintain my health by consulting health professionals

-3 -2 -1 +1 +2 +3

29) No matter what I do, I'm likely to get sick

-3 -2 -1 +1 +2 +3

30) It seems that my health is greatly influenced by accidental happenings

-3 -2 -1 +1 +2 +3

31) If it's meant to be, I will stay healthy

-3 -2 -1 +1 +2 +3

32) If I see an excellent doctor regularly, I am less likely to have health problems

-3 -2 -1 +1 +2 +3

33) If I take the right actions I can stay healthy

-3 -2 -1 +1 +2 +3

34) Often I feel that no matter what I do, if I am going to get sick, I will get sick

-3 -2 -1 +1 +2 +3

35) Regarding my health, I can only do what my doctor tells me to do

-3 -2 -1 +1 +2 +3

36) If I become sick, I have the power to make myself well again

-3 -2 -1 +1 +2 +3

GO ON TO THE FINAL QUESTIONNAIRE

APPENDIX D

Ways of Coping Questionnaire

Questionnaire 4

Directions. Please read each item below and indicate, by circling the appropriate category, to what extent you used it in coping with the aftermath of your head injury.

0 - not used

1 - used somewhat

2 - used quite a bit

3 - used a great deal

---

1. Just concentrated on what I had to do next - the next step.	0	1	2	3
2. I tried to analyze the problem in order to understand it better.	0	1	2	3
3. Turned to work or substitute activity to take my mind off things.	0	1	2	3
4. I felt that time would make a difference - the only thing to do was to wait.	0	1	2	3

5. Bargained or compromised to get something positive from the situation.	0	1	2	3
6. I did something which I did'nt think would work, but at least I was doing something.	0	1	2	3
7. Tried to get the person responsible to change his or her mind.	0	1	2	3
8. Talked to someone to find out more about the situation.	0	1	2	3
9. Criticized or lectured myself.	0	1	2	3
10. Tried not to burn my bridges, but leave things open somewhat.	0	1	2	3
11. Hoped a miracle would happen.	0	1	2	3
12. Went along with fate; sometimes I just have bad luck.	0	1	2	3
13. Went on as if nothing had happened.	0	1	2	3
14. I tried to keep my feelings to myself.	0	1	2	3
15. Looked for the silver lining, so to speak; tried to look on the bright side of things.	0	1	2	3
16. Slept more than usual.	0	1	2	3
17. I expressed anger to the person(s) who caused the problem.	0	1	2	3
18. Accepted sympathy and understanding from someone.	0	1	2	3
19. I told myself things that helped me to feel better.	0	1	2	3

20. I was inspired to do something creative.	0	1	2	3
21. Tried to forget the whole thing.	0	1	2	3
22. I got professional help.	0	1	2	3
23. Changed or grew as a person in a good way.	0	1	2	3
24. I waited to see what would happen before doing anything.	0	1	2	3
25. I apologized or did something to make up.	0	1	2	3
26. I made a plan of action and followed it.	0	1	2	3
27. I accepted the next best thing to what I wanted.	0	1	2	3
28. I let my feelings out somehow.	0	1	2	3
29. Realized I brought the problem on myself.	0	1	2	3
30. I came out of the experience better than when I went in.	0	1	2	3
31. Talked to someone who could do something concrete about the problem.	0	1	2	3
32. Got away from it for a while; tried to rest or take a vacation.	0	1	2	3
33. Tried to make myself feel better by eating, drinking, smoking, using drugs or medication, etc.	0	1	2	3
34. Took a big chance or did something very risky.	0	1	2	3

35. I tried not to act too hastily or follow my first hunch. 0 1 2 3
36. Found new faith. 0 1 2 3
37. Maintained my pride and kept a stiff upper lip. 0 1 2 3
38. Rediscovered what is important in life. 0 1 2 3
39. Changed something so things would turn out all right. 0 1 2 3
40. Avoided being with people in general. 0 1 2 3
41. Didn't let it get to me; refused to think too much about it. 0 1 2 3
42. I asked a relative or friend I respected for advice. 0 1 2 3
43. Kept others from knowing how bad things were. 0 1 2 3
44. Made light of the situation; refused to get too serious about it. 0 1 2 3
45. Talked to someone about how I was feeling. 0 1 2 3
46. Stood my ground and fought for what I wanted. 0 1 2 3
47. Took it out on other people. 0 1 2 3
48. Drew on my past experiences; I was in a similar situation before.
49. I knew what had to be done so I doubled my efforts to make things work. 0 1 2 3
50. Refused to believe that it had happened. 0 1 2 3

51. I made a promise to myself that things would be different next time. 0 1 2 3
52. Came up with a couple of different solutions to the problem. 0 1 2 3
53. Accepted it, since nothing could be done. 0 1 2 3
54. I tried to keep my feelings from interfering with others things too much. 0 1 2 3
55. Wished that I could change what had happened or how I felt. 0 1 2 3
56. I changed something about myself. 0 1 2 3
57. I daydreamed or imagined a better time or place that the one I was in. 0 1 2 3
58. Wished that the situation would go away or somehow be over with. 0 1 2 3
59. Had fantasies or wishes about how things might turn out. 0 1 2 3
60. I prayed. 0 1 2 3
61. I prepared myself for the worst. 0 1 2 3
62. I went over in my mind what I would say or do. 0 1 2 3
63. I thought about how a person I admire would handle this situation and used that as a model. 0 1 2 3
64. I tried to see things from the other person's point of view. 0 1 2 3

65. I reminded myself how much worse things could be. 0 1 2 3

66. I jogged or exercised. 0 1 2 3

Thank you for your participation in this follow-up study - please return these questionnaires using the enclosed envelope. We will be sending you the results of the study in a short while.

APPENDIX E

The Glasgow Coma Scale

Eye Opening	Score
Spontaneously	4
To verbal command	3
To pain	2
No response	1

Best Motor Response	Score
(To verbal command/painful stimulus)	
Obeys	6
Localizes pain	5
Flexion - withdrawal	4
Flexion - abnormal (decorticate ridgidity)	3
Extension (decerebrate ridgidity)	2
No response	1

Best Verbal Response	Score
Oriented and converses	5
Disoriented and converses	4
Inappropriate words	3
Incomprehensible sounds	2
No response	1

Total Score	3 - 15

APPENDIX F

Letter requesting participation sent to potential subjects

Dear Former Manitoba Head Injury Study Participant:

The Health Sciences Center / University of Manitoba are conducting a joint follow-up study to investigate further the effects of head injury. This research is directed towards finding out more about what strategies you and your family used to help you get over this stressful time - specifically, how your thoughts and feelings are/were related to your recovery. It is our hope that research such as this will allow us to program more effective rehabilitation and counselling services for people who in the future, sustain head injuries.

If you agree to participate in this new research, we will be asking you and your spouse or closest relative to fill out three short questionnaires which will focus on some specific thoughts and feelings which may be related to outcome following head injury. As the questionnaires are quite a lot shorter than the package you completed for us some months ago, we will

be mailing the questionnaires out to your home should you agree to participate. We will include instructions and a stamped return envelope. These questionnaires should not take more than 15 to 20 minutes to complete.

You are assured that this research and all research materials will be kept strictly confidential and will not be released under any circumstances. We are not concerned with the answers of any one individual, but with the answers of all people who participate in this research as a group.

If you are willing to assist us with this important follow-up study, please indicate 'yes' on the enclosed reply page and return this to us in the enclosed self-addressed envelope. If you do not wish to participate, please answer 'no' and also return it to us. You are completely free to decline participating in this follow-up project without any fear of penalty or without effecting future medical care. Participation is entirely voluntary, and you are free to withdraw at any time, as well as to refuse to answer any of the questions that are posed to you. However, because you are one of a relatively small group of individuals who have experienced a head injury, and have consented to assist our research program in the past, your continued participation in this follow-up research is very important and would be

greatly appreciated. It is only through the continued interest and participation of people like you that we can continue to expand and increase our knowledge concerning the effects of head injury. As you are aware, this knowledge is vital if we are to continue to improve treatment planning and delivery.

If you have any questions about the study, please feel free to call 787-2312 during normal business hours and ask for Allan Moore. Thank you for your continued interest and participation in the Manitoba Head Injury Study.

Yours sincerely,

Allan Moore, B.A. (Hons.)
Neuropsychology Research Unit Manager for

Michael Stambrook, Ph.D., C.Psych
Assistant Professor

APPENDIX G

Follow-up letter sent to participants

Dear Manitoba Head Injury Program Follow-Up Study Participants:

Thank you again for your participation in the follow-up study. The reason for this letter is to inform you of the purpose and results of the follow-up study you participated in during the past few months. One of the unanswered questions we had after looking at the data from the first study you participated in, was, what role did thoughts and feelings have in the recovery from head injury? Specifically, we were interested in how thoughts and feelings about control play a role in long-term outcome. You may have heard in the news about a psychological term called "Locus of Control". Locus of control has to do with thoughts and feelings people have about who, or what is responsible for things that happen to them. People who have Internal locus of control beliefs feel that things that happen to them occur because of their own efforts or something about themselves. People who have External locus of control beliefs feel that things happen to

them as a result of others, or as a result of luck. In the follow-up study, we were interested in finding out what kind of locus of control beliefs people who sustained head injuries had, how these feelings and thoughts were related to the kinds of things people do to cope with stressful situations, and how these feelings and thoughts were related to long-term outcome.

What we found out was that locus of control beliefs were not associated with the severity of the initial head injury. That is, severely, moderately, and mildly head injured persons as a group did'nt differ in their beliefs about what or who is responsible for things that happen to them. Secondly, we found that for some people, high internal locus of control beliefs were associated with good outcome. In other words, for some people, a belief that they were responsible for things that happened to them was associated with good long-term outcome. I should emphasize here that this finding is a group finding, and was not applicable to any one person. In fact, we found that a variety of different locus of control beliefs and coping strategies were associated with good outcome.

What do these results mean for head injured persons? Well, we hope that by examining how thoughts

and feelings effect how well people do after head injury, that we can suggest how people can think about what has happened to them, and how to deal with the frustrations and trials that you are aware, are a part of living with the effects of a head injury.

A large portion of the results of this follow-up will form the basis for my Masters of Arts thesis in Clinical Psychology that I will be defending this summer, and we will be presenting, and hopefully publishing the results in the next year. Once again, on behalf of all of us at the Neuropsychology Research Unit, I would like to take this opportunity to thank you for your participation in what has been two extensive research projects into the effects of head injuries. I hope this letter answers your questions about what the study was about, and informs you about the important role that you have played in helping us find out more about what it's like to live with the effects of head injury. By sharing with us, you have helped us, and health care professionals in Canada, and internationally, understand head injuries a little better - which in the end, will help others who, unfortunately, sustain head injuries in the future. If you have any further questions about the purpose or results of this study, I would be happy to hear from you. Thank you again for your participation in the Manitoba Head Injury Study.

Allan Moore, B.A.(Hons.)

Neuropsychology Research Unit Manager

for

Michael Stambrook, Ph.D., C.Psych.

Assistant Professor