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Symptoms and Self-Concept Alterations with and Without Cognitive Rehabilitation 2 - 5 Years After Mild Traumatic Brain Injury

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SYMPTOMS AND SELF-CONCEPT ALTERATIONS
WITH AND WITHOUT COGNITIVE REHABILITATION
2 - 5 YEARS AFTER MILD TRAUMATIC BRAIN INJURY

by

Rebecca H. Veltman

A THESIS

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ABSTRACT

SYMPTOMS AND SELF-CONCEPT ALTERATIONS

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This study examined adaptation in physical symptoms, role functioning, and self concept 2-5 years after mild traumatic brain injury (MTBI). The effects of outpatient cognitive rehabilitation were also analyzed. Roy's Adaptation Model provided a framework for this study. Subjects (n=164) were surveyed about role function, physical post-concussion symptoms, and self concept. Sixty-six subjects returned the completed survey. Subjects reported problems with memory (33%), tiredness (29%), depression (27%), and concentration (26%). The number of new symptoms and the social score were inversely related ($r=-.5854$, $p=.001$). Self Concept as measured on the Tennessee Self Concept Scale (TSCS) was below the average range in Behavior, Moral Ethical Self, Physical Self, and Identity. The rehabilitated group (n=15) had statistically significant lower TSCS scores than the non-rehabilitated group (n=49) on the following subscales: Family, Social Self, Self Satisfaction, Behavior and the Total Score. Study results indicate that some persons with MTBI are at risk for physical sequelae and lowered self concept.

This thesis is dedicated to my husband and children, who
supported and loved me through this endeavor.

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CHAPTER 1

INTRODUCTION

Over seven million persons sustain head injuries yearly, with over three fourths categorized as having sustained "mild" brain trauma (Mann, 1991). Persons who sustain brain trauma categorized as "mild" may have long term physical, emotional, and psycho-social problems resulting from their injury (Bornstein, Miller, & Van Schoor, 1989; Edna, 1987; McLean, Dikmen, Temkin, Wyler & Gale, 1984; Mahon & Elger, 1989; Rimel, Bruno, Barth, Boll, & Jane, 1981). In many cases, these sequelae after mild traumatic brain injury (MTBI) prevent persons from returning to their previous normal activities. Current published research is available that examines the prevalence of cognitive, physical, psycho-social, and emotional sequelae up to five years after MTBI. However, there is no research that addresses the effects of this injury on self concept. Several authors hypothesize (Bornstein, Miller, & Van Schoor, 1989; Rimel et al., 1981) that self concept can be negatively affected by both the physical sequelae from MTBI and the lack of understanding from significant others. Little research exists that examines how persons adapt over

time to MTBI or what factors may influence adaptation.

Mild Traumatic Brain Injury

The short term effects of MTBI have been studied at length by several authors (Coonley-Hoganson, Sachs, Desai, & Witman, 1984; Gronwall & Wrightson, 1974; Rimel et al. 1981). The symptoms experienced by some patients usually fall in the following categories: 1) physical problems, such as headaches and dizziness, 2) psychiatric or emotional problems, such as mood swings, irritability, and depression, and 3) problems with cognition, such as memory and concentration. These symptoms can affect a person's ability to return to normal activities of daily living. Gronwall and Wrightson (1974) found that over 50% of patients with MTBI complained of at least one symptom six weeks after injury. Rimel et al. (1981) found that approximately 50% of her subjects complained of symptoms up to three months after MTBI. Edna (1987) reported that persons with MTBI have post-concussional problems even three to five years after injury. Problems returning to work or functioning at work were found in 30% to 60% of subjects in several studies (Wrightson & Gronwall, 1972; Rimel et al. 1981).

Persons who sustain a concussion or "bump on the head" may not expect to have serious problems for an extended time after injury. Many of these patients are not admitted to the hospital; they are advised to go home and rest and to go back to work and their normal activities. Much to their

surprise, they find themselves unable to function in their previous capacity. Simple conversations may be impossible due to attention and conversation problems (Rimel et al., 1981). Patients may lose their jobs. Emotional lability can cause marital strain and psychosocial problems. Depression may occur (Schoenhuber & Gentilini, 1988). Individuals may become frustrated as they attempt to return to their previous abilities, yet are unable (Bornstein, Miller, & Van Schoor, 1989).

Nursing Influences

A person who has sustained MTBI may not have much contact with nurses or physicians. He may be seen in the emergency room, and then discharged, or sent home after a short hospital stay for observation. Nursing, as a profession which seeks to treat clients holistically, is concerned with each client's quality of life.

Nursing theories and conceptual frameworks address the concept of holism. The Roy Adaptation Model (Roy & Andrews, 1991) views nursing as being concerned with the person as a total being. Roy views the person as having four adaptive modes: physiologic, self-concept, interdependence, and role function. In the application of this model to the nursing care of patients with MTBI, nurses must be concerned with assisting the client to adapt to the sequelae resulting from MTBI.

In the past, nursing has attempted to promote

adaptation to the problems experienced by persons with MTBI. The most common nursing interventions identified in the literature are education and reassurance. Two studies have examined the effectiveness of these interventions (Casey, Ludwig, & McCormick, 1987; Hinkle, Alves, Rimel, & Jane, 1986). Although the general trend for both studies was for patients to have fewer symptoms, neither study had significant findings.

Several authors suggest that cognitive retraining or rehabilitation is one treatment option for persons who have symptoms caused by MTBI (Gronwall, 1986; Wrightson & Gronwall, 1970; Askenasy & Rahmani, 1988). Cognitive retraining is a rehabilitation program, usually outpatient, with the goal of increasing the patient's ability to handle and process information and transform it into purposeful actions (Askenasy & Rahmani, 1988). Nurses are an important part of the rehabilitation team, both in the acute care setting and in rehabilitation centers. If successful, cognitive rehabilitation has the potential to help persons return to work faster and with less disability. Patients could experience less depression and an increased self concept as they not only function better but also obtain a better understanding of their abilities and needs. Although the physical symptoms may remain, patients may learn ways in which to function better and to feel better about themselves.

Nurses, as the primary care givers for patients in the hospital and in out-patient settings, must be aware of the possible effects of MTBI on their patients. This information can be used to assess for problems post injury, to anticipate needs, to obtain interdisciplinary support and referral, and to teach patients and families.

Purpose

The purpose of this study was to describe adaptation to MTBI over time, and to compare the adaptation of persons who attended cognitive rehabilitation with those who did not.

CHAPTER 2

LITERATURE REVIEW

Review of Literature

Definition of Mild Traumatic Brain Injury

There are many varied definitions of what constitutes a mild brain injury. Most studies use the criteria of brief loss of consciousness after sustaining trauma, with transient neurologic deficits (Edna, 1987). Many researchers use the Glasgow Coma Scores between 13 to 15 as additional criteria (Rimel, Bruno, Barth, Boll, & Jane, 1981; Mahon & Elger, 1989). Other authors use exclusion criteria, such as no findings upon computerized tomography scans (Edna, 1987). Some authors use the criteria of post-traumatic amnesia to further define MTBI (Gronwall & Wrightson, 1974). Most of the MTBI literature shows inconsistency in definitional criteria. No consistent definition is noted in the following research review.

Mild Traumatic Brain Injury: Incidence and Epidemiology

Mild traumatic brain injury (MTBI) is a frequent and costly injury. Traumatic brain injury occurs to seven to eight million persons each year (Mann, 1991). Approximately 80% of all traumatic brain injury is of a mild nature. Over 70% of persons who sustain MTBI are under the age of 35.

70% of persons who sustain MTBI are under the age of 35. Fifty percent of all MTBI is caused by motor vehicle crashes. Approximately one-third of patients who sustain MTBI do not return to work within three months. Although most mild traumatic brain injured workers return to their employment within six months, one third of those struggle in their employ, and are unable to function at previous levels (McMahon & Flowers, 1986).

Mild Traumatic Brain Injury: Morbidity

Many studies have been conducted that examine the morbidity associated with MTBI. Gronwall and Wrightson (1974) studied patients' ability to process information after MTBI. The sample included 100 patients diagnosed with concussion who had also exhibited post traumatic amnesia of less than 25 hours. Patients with intracranial damage or previous brain injury were excluded from the study. Three groups were studied: 1) 10 males with post-concussion symptoms age 17 to 25, who had complained of post concussion symptoms and had difficulty returning to work, 2) a control concussion group of 10 male patients age 17 to 25 who had no post-concussion symptoms, and 3) a concussion group of 80 patients of all ages of either sex.

Data were collected one to 35 days after injury, and weekly or monthly thereafter until testing yielded normal results. The Paced Auditory Serial Addition Test (PASAT) was used to detect the rate of information processing.

PASAT scores and the rate of information processing are directly related. Results of the study showed significantly below normal PASAT scores for all groups when first tested. In group 1, normal test scores were reached 35 to 54 days after injury. In group 2 and for most of group 3, all tests scores were normal by 35 days after injury. The difference between the recovery time between group 2 and group 1 is statistically significant ($p=0.003$). In group 1, post concussion symptoms decreased as PASAT scores increased. The researchers concluded that the physical and cognitive symptoms experienced by some patients with MTBI can be attributed to this reduction of information processing.

This study is important because it supports the hypothesis that the symptoms patients with MTBI complain about may be due to actual brain injury, rather than the patient's ability to cope. However, the study design is very weak due to several factors. Groups 1 and 2 consisted of only 10 subjects each -- a larger sample would give more credibility to the results. In addition, testing of the subjects was done at different time intervals for each group. Finally, the conclusion by the researchers that patient symptoms decreased as PASAT scores increased was not supported by systematic measurement and seemed to be reached by observation.

Another study, conducted by Rimel et al. (1981), examined the disability associated with MTBI. This

prospective study included a sample of 538 patients with MTBI over a 20 month time period. The subjects were admitted for hospitalization for less than 48 hours. Additional criteria for inclusion were: 1) Loss of consciousness (LOC) of 20 minutes or less, and 2) Glasgow coma scores of 13 to 15. The Glasgow coma scale is a scale that measures level of consciousness. Scores greater than 12 usually indicate a mild injury. Only 6% of the subjects had computed tomography scans (CTs), and all were normal. All subjects were assessed neurologically at the time of admission. Other data were collected by record review. Morbidity data were collected at three months.

All patients were seen three months after injury. Those patients (n=27) who did not show up for their follow-up appointment were contacted by telephone. Total response rate was 424 (80%) patients. Psychosocial data were collected on 221 patients using a symptom rating exam and a brief physical recovery checklist. Neuropsychological assessment was conducted on a subsample of 133 patients using the Halstead Neuropsychology Battery, the Wechsler Scales of Intelligence and Memory, and the Wide Range Achievement Test. Statistical analysis included Chi-square for categorical variables, and a Student's t-test for sample means.

Results included the following. Over 70% of the subjects sustained a LOC of 10 minutes or less. By

discharge from the hospital, all patients had a normal neurologic examination. The subjects complained of problems with headaches (78%), memory (59%), difficulty with daily living (14%), and a change in financial status (49%) three months after injury. Of the subjects who were employed at the time of their injury, 34% were unemployed at the 3 month follow up. Factors which influenced return to work were age, education, employment, income, and socio-economic status. The Halstead-Reitan Neuropsychological Test procedure showed mild impairment for most patients tested in higher level cognitive functioning, new problem solving skills, and attention and concentration. Psychosocial assessment showed that unemployed subjects described more problems, specifically somatic and physical, than the employed. This was also verified by their significant others.

This study contains a large sample and has important findings. Unfortunately, due to funding, not all of the subjects were given all of the tests. It would have been interesting to have a control group composed of persons recently hospitalized for non-head injury problems take the same tests for comparison.

Several studies examined the short term morbidity of patients with MTBI. Coonley-Hoganson, Sachs, Desai, and Whitman (1984) in telephone interviews with MTBI patients (n=262) found that one week after discharge from an

emergency department for MTBI, patients complained of headache (27.2%), dizziness (11.4%), drowsiness (8.8%), and nausea and/or vomiting (9.2%). In addition, 13% had not resumed their normal activities by one week after injury. Mahon and Elger (1989) contacted patients (n=75) admitted to the hospital with the diagnosis of MTBI at 24 hours, three months, and six months after injury. The subjects were contacted by personal interview, telephone interview, and/or mailed questionnaires. The results showed that patients complained of similar symptoms, such as headache (59%), dizziness (28%), fatigue (27%), short-term memory problems (15%), decreased attention (13%), restlessness (13%), insomnia (13%), blurred vision (13%), slow thought processes (7%), and noise intolerance (4%) 24 hours to six months after injury. Sixty percent of the sample still had symptoms at three months, and of these 21% continued to have problems at the 6 month interview. Overall, 85% of the subjects developed some symptoms after injury.

O'Shaughnessy, Fowler and Reid (1984) examined the incidence of cognitive deficits one week and six month after MTBI. Subjects (n=60) were examined one week and six months after injury by a physician using a battery of psychometric tests. Results showed that at one week 50% of the subjects showed impaired cognitive functioning. At six months, 26 to 56% continued to have impaired cognitive functioning.

VanDongen, Veltman, Bostrom, Buechler, and Blostein (1993)

conducted a follow-up study of 146 patients who were discharged to home following hospitalization for trauma. Structured telephone interviews or mailed surveys were used one week and one month after discharge to collect the data. Results showed that a significant number of patients with MTBI had difficulties with concentration, memory, and with functioning at work one month after discharge.

These studies are important support for the hypothesis that MTBI may cause problems up to six months after injury. Edna (1987) examined even further the longer term morbidity associated with MTBI. This study looks specifically at morbidity, employment, and social alterations 3 to 5 years after hospital admission for MTBI. This study was conducted prospectively with the sample selected from successive patients admitted to four different hospitals over a two year period. The subjects were included if they had a period of loss of consciousness for one hour or less and did not develop an intracranial hematoma. The sample included 361 patients, age 15 to 64. A questionnaire that assessed post concussional complaints, family life, social activities, and employment was sent by mail 3 to 5 years after the injury. A control group of 110 subjects 3 to 5 years after appendicitis was randomly selected to match the head injury group with respect to age and sex. Results showed statistically significant complaints in the head injured group. These included headache, dizziness,

irritability to noise or light, and hearing deficits. Patients with skull fractures were more likely to have new symptoms, and a significant increase in memory impairment, dizziness, and concentration difficulties. Length of loss of consciousness did not determine the frequency of symptoms. Symptoms increased slightly relative to post traumatic amnesia. Intercorrelations of new complaints were calculated using phi coefficients. The following four groupings of symptoms were correlated: 1) headache and dizziness, 2) hearing deficits and tinnitus, 3) impaired memory, concentration and fatigue, and 4) anxiety, depression, and insomnia. No pre-injury complaints predisposed the subjects to new postconcussional symptoms. Unemployment rose from 12% at the time of injury to 24% at follow up. The control group also had more unemployment at follow up with a rise from 4% to 16%. The unemployed group with MTBI had more postconcussional symptoms, were older, had less education, and were more often unemployed at the time of injury than the employed group with MTBI. The social score at follow up was significantly worse for the subjects with MTBI than for the control group.

This study has an excellent design, using a matched control group, a relatively large sample size, a specific questionnaire, and appropriate statistical analysis. It gives important information concerning long term morbidity in patients with MTBI. Meaningful information concerning

correlation of symptoms was examined. It was interesting that the MTBI subjects and the control group had the same increase in unemployment (both increased 12%). It would be helpful to know if the unemployment was due to the MTBI or other causes, such as economic recession. It appears that the researcher assessed the subjects' pre-injury status in the 3 to 5 year follow up questionnaire. This information may have been more reliable if it had been collected during the initial hospitalization.

Psychosocial Effects of Mild Traumatic Brain Injury

Most research concerning MTBI examines the overall morbidity associated with the trauma. Several authors, however, have specifically examined the effects of head injury on psychosocial functioning. One example of this is a study conducted by McLean, Dikmen, Temkin, Wyler, and Gale (1984). The sample included 102 subjects with MTBI selected over a two year period who met the following criteria: 1) loss of consciousness for at least 10 minutes, 2) hospitalization due to head injury, 3) no history of prior central nervous system deficits, and 4) age 15 to 60. A control group (n=102) as selected by friends of the subjects, were selected to be similar to the head injured subjects in demographic and psychosocial characteristics. The control group had no MTBI. One month after injury, the subjects were assessed using the Modified Sickness Impact Profile (SIP), a head injury symptom checklist, a rating

scale of the subject's perception of his/her functioning, and a structured interview.

Results showed that the head injured group differed significantly from the control group on the SIP. They had problems with sleep, body care, home management, social interactions, ambulation, alertness behavior, pasttimes and recreation, and work. The head injury symptom checklist identified problems with headaches, fatigue, dizziness, blurred vision, concentration, noise sensitivity, memory, and insomnia. Interestingly, head injury severity did not correlate with increased problems identified on the checklist. Severe limitations were noted in the head injured group, specifically in activities such as returning to work, school, or homemaking. There was a trend for subjects with less severe injury to show greater emotional distress. Physical postconcussional symptoms seemed to be unrelated to head injury severity.

This is an interesting study with a detailed design. The matched control group, specific test instruments, and moderate sized sample all add to its credibility. Particularly of interest is that the less severe head injured patients had greater emotional distress. It is possible that this is due to the patients' unsuccessful attempts to return to work and other activities. Conversely, patients with more severe head injuries are not expected to return to their normal activities without

intervention. It would have been interesting to have collected these data again six months after injury, as some of the subjects had fairly severe head injuries and could reasonably require more than one month for recovery.

One other study (Casey, Ludwig, & McCormick, 1986) examined the morbidity associated with minor head trauma in children one month after injury. Parents were randomly placed in either a control group or an intervention group. The control group received routine discharge instructions. The intervention group received more in-depth discharge instructions and a follow up phone call by a nurse. One month after injury, a structured telephone interview was conducted. Results of the study showed that the children had a high percentage of school absenteeism (29 to 40%). Twenty-seven percent of the children had behavioral problems. There was no difference in the control group and the intervention group. The authors hypothesized that the behavioral and functional deficits were due mostly to parental anxiety and over-concern. Interestingly, the authors (Casey, Ludwig & McCormick, 1987) conducted a subsequent study which examined his hypothesis. Results showed that interventions aimed at reducing the parents' anxiety did not significantly decrease the behavioral and functional problems the children experienced after MTBI. Other research supports the hypothesis that adults who sustain MTBI can have sequelae resulting from their injury.

Therefore it is likely that children also experience real sequelae, as opposed to being the result of parental "anxiety." Thus, role function alterations can be seen in children as well as in adults.

Emotional and Psychological Sequelae of MTBI

Several current studies have examined the occurrence of emotional and/or psychological sequelae after MTBI. Bornstein, Miller, and Van Schoor (1989) studied the relationship between neuropsychological deficit and emotional disturbance in 124 patients with head injuries. The head injuries varied in severity from mild to severe, although the majority of the subjects (64%) had MTBI. Neuropsychological examination was performed on the patients three months to three years after injury. Results showed that patients with neuropsychological impairments were significantly more likely to have emotional disturbance, as indicated on the Minnesota Multiphasic Personality Inventory. The authors concluded that "it appears that being unable to function at previous levels of excellence results in dramatic loss of self esteem (with the expected psychological concomitants)" (p. 512). It is important to note that no testing was performed prior to the head injury; thus, it is not possible to determine the presence of emotional disturbance prior to the injury.

Schoenhuber and Gentilini (1988) examined the incidence of depression and anxiety in 35 subjects five to 17 months

after MTBI. The results showed that the subjects with MTBI were at a high risk for developing depression ($p=.003$) compared to the matched control group. Barth, Macciocchi, Giordani, Rimel, Jane, and Boll (1983) also examined the occurrence of neuropsychological sequelae in 71 patients three months after MTBI. Results showed that a large number percent (39%) of the subjects showed impairment on the Minnesota Multiphasic Personality Inventory.

These studies are significant because they support the theory that MTBI can not only cause physical problems, but emotional and/or psychological problems as well. It is likely that the origin of these problems can be due to either the brain injury itself, or frustration at the inability to return to previous activities. If the above studies are considered, it becomes evident that no matter what the cause, emotional and psychologic sequelae should be addressed when caring for persons with MTBI in a holistic manner.

Self-Concept and Illness

No current studies examine the effect of MTBI on self-concept. Several authors (Rimel et al., 1981; Bornstien et al., 1989) speculate that sequelae from MTBI may cause problems with self-concept. Some literature explores the effects of other illnesses and disabilities on self-concept. An excellent example of this is in a study by Green, Pratt, and Grigsby (1984) in which self-concept among persons with

long-term spinal cord injury was explored. Seventy-one persons with SCI for at least four years were given the Tennessee Self-Concept Scale (TSCS) and a demographic questionnaire. Results showed that the spinal cord injury group had overall a higher self-concept than the TSCS norm means, except in the subscale which measured 'physical self'. Younger subjects, those with higher levels of education, and those with assisted living arrangements tended to have a higher self-concept when compared with other subjects.

Yates and Belknap (1991) examined the predictors of physical functioning in 46 patients who had sustained a cardiac event. One area investigated was self-esteem. Subjects showed moderately high levels of self-esteem using Rosenberg's self-esteem scale. Patients who had returned to their normal activities successfully, were less confined, and had to rely less on others reported higher levels of self-esteem and lower levels of depression.

These studies yield some surprising results. It seems logical that persons who have sustained spinal cord injury or cardiac events would possibly have a lower self-concept. However, in both of the above studies, the subjects had relatively positive self-concepts. Persons who sustain spinal cord injury or cardiac events are generally involved with rehabilitation efforts to some extent, which may offer support and encouragement.

Rehabilitation

Cognitive rehabilitation is defined as formal outpatient treatment with the goal of remediating a lost or impaired cognitive skill, or to teach persons ways in which to compensate for cognitive impairment (Benedict, 1991). Cognitive rehabilitation involves specialized treatment to meet the needs of the patient. For example, patients with memory deficits may be taught to make lists and schedules. Out-patient cognitive rehabilitation for persons with MTBI has traditionally been conducted by therapists, as described in the above definition. However, nurses can be and should be a part of this rehabilitation process. The initial assessment and referral of patients to rehabilitation programs is often done by nurses. Rehabilitation nurses in in-patient settings have always been a major part of the rehabilitation team. Nurses should be involved in all phases of the cognitive rehabilitation treatment for patients with MTBI. In addition, nurses should begin the rehabilitation process in the acute care setting. Many patients with MTBI have accompanying injuries which keep them hospitalized for extended periods of time. Early intervention with cognitive rehabilitation can assist patients to make an earlier recovery.

Research supports rehabilitation for persons with moderate to severe traumatic brain injury (Ben-Yishay, Silver, Piasetsky, & Rottok, 1987; Schleuderer, Short, &

Crisler, 1988; Do, Sahagian, Schuster, & Sheridan, 1988; and Ruff, Baser, Johnston, Marshall, Klauber, & Minter, 1989). However, there is little research on the efficacy of rehabilitation for persons who sustain MTBI. Measuring the outcome of rehabilitation is difficult for many reasons, such as the difficulty of identifying an appropriate control group and identifying a measure to evaluate effectiveness.

Gronwall (1986) conducted two consecutive studies with the purpose of evaluating rehabilitation as a treatment for persons with MTBI. The first study included 237 patients treated for MTBI from 1972 to 1982 who met the following criteria: 1) observed in the emergency room at Auckland Hospital for MTBI but not admitted to the hospital, 2) between 17 and 40 years of age, 3) no history of previous head injury, alcoholism, or psychiatric illness, and 4) first assessed within 2 weeks of injury. The subjects were referred for a 3 stage rehabilitation program. Stage 1 included individual counseling, reassurance and assessment using the following types of tests: 1) Paced Auditory Serial Addition Task (PASAT), which measures information processing, 2) language measures, 3) visual perception, and 4) visual reaction time. Stage 2 included attendance by the subjects at the clinic for 3 hours a morning 3 days per week. Subjects attended group and individual activities including stress management, assessment, and cognitive rehabilitation. The rehabilitation sessions were continued

until the mean PASAT time scores recovered to less than 4 seconds. At that time, the subjects were advanced to stage 3 of the program, in which activities such as work and driving were slowly initiated, depending on the subject's progress. Evaluation of the rehabilitation program was measured by the PASAT scores. The mean time from injury to stage 3 was 3.5 weeks with a range from 2 to 9 weeks. No comparison data were provided.

Gronwall (1986) conducted a subsequent study using identical criteria for subject selection. The subjects (n=89) attended the same 3 step rehabilitation program as described in the first study. A survey was conducted investigating symptoms 3 months after injury. All except 2 subjects (2.3%) were symptom free 3 months after injury. In a comparison group of 63 patients who did not attend the rehabilitation sessions, 13 subjects (20%) still reported at least one symptom 3 months after injury.

Both of the above studies provide important information on the efficacy of rehabilitation programs for patients with MTBI. None of the subjects in these studies were hospitalized, and thus had less severe injuries than some persons who are classified as having MTBI. This criterion for inclusion in the studies probably provided more homogeneous samples. The researchers fail to mention whether or not the subjects had identified sequelae resulting from their MTBI that precipitated their referral

to rehabilitation, or if all patients were referred for rehabilitation regardless of head injury symptoms. Another concern is the use of the PASAT. The first study used PASAT scores to evaluate the rehabilitation program. However, as the researcher acknowledges, there is no control group with which to compare the PASAT scores. It would have been helpful to measure the subjects' physical symptoms and back to work status in addition to the PASAT scores as the PASAT test only measures information processing.

The second study, although simple, gives much support to the rehabilitation program. The author fails to mention what symptoms were measured, however. It would be interesting to know what symptoms the subjects complained of before rehabilitation as compared to the comparison group. Also, the sample was small. Again, return-to-work data would have been informative.

Conceptual Framework

Roy's Adaptation Model

Roy's Adaptation Model is a systems model. Man is seen as being in constant interaction with the environment. The environment is defined as "the world around and within the person" (Roy & Andrews, 1991, p.18). The environment is constantly changing. Man uses four adaptive modes to cope with the environmental changes. These include the physiologic, self-concept, role function, and interdependence modes. The physiologic mode is associated

with physiological functioning. The self concept mode focuses on the spiritual and psychological aspects of the person. The interdependence mode is the social mode, which is concerned with the person's relationships with others. The role function mode focuses on the roles the person inhabits in society (Roy & Andrews, 1991).

When assessing these 4 adaptive modes, nurses consider whether or not the person is coping with the internal and external environment. When man is able to cope with the environment, adaptation has occurred. A maladaptive response occurs when man is unable to cope with his environment (Roy & Andrews, 1991). This study will examine the person's adaptation in the physiologic, role function, and self-concept modes. A more detailed description of these adaptive modes follows.

The Physiologic Mode

Roy (1976) states that the physiologic mode is based on the person's physiologic integrity. Roy further breaks down this mode as to different types of physiologic needs. These include: exercise and rest, nutrition, elimination, fluid and electrolytes, oxygen, circulation, and regulation. The assessment of this mode is achieved through physical assessment. Patients who have neurologic problems resulting from their MTBI, such as dizziness, memory difficulties, headaches, and other ailments may have difficulty adapting in the physiological mode.

The Role Function Mode

Roy (1976) incorporates a variety of theorists to describe role function. Role is defined as "the title given to the individual, mother, son, student, carpenter - as well as the behaviors that society expects an individual to perform in order to maintain the title" (Roy, 1976, p. 247). Role function is based on two assumptions. First, roles exist only in relation to each other. Each person's role is dependent on another person's role. For example, a mother must have a child. Second, for persons to master roles, they must be able to perceive themselves performing the role. Otherwise, they may not be able to master the role.

Roy describes primary, secondary and tertiary roles. The primary role is equated to the major behaviors engaged in during the person's specific developmental level. The secondary roles are related to the tasks the person must accomplish in order to maintain autonomy. The tertiary role is a temporary role that the individual performs to meet a task associated with their developmental stage. Examples include cheerleading in adolescence.

For the purpose of this study, the effects of MTBI on the secondary roles of student, homemaker, spouse, friend, and the working adult will be examined.

The Self Concept Mode

As discussed earlier, self concept in persons with MTBI has not been studied. However, it is important to assess

this adaptive mode. Andrews states that "perception of the self plays a major part in everything a person does" (Roy & Andrews, 1991, p. 270). Self concept has been defined in many ways. For the purpose of this study, it will be defined using the works of Fitts (Fitts, 1965; Fitts, Adams, Raadford, Thomas, Thomas, & Thompson, 1971; Roid & Fitts, 1991) and Roy (Roy, 1976, Roy & Andrews, 1991). Fitts et al., (1971) defines self concept as being the "self as seen, perceived, and experienced" by the person (p. 3). Driever (1976), in an explanation of the self-concept mode in Roy's Adaptation Model, similarly describes self-concept as the beliefs and feelings one has about oneself. The self-concept has two divisions - the physical self and the personal self (Roy & Andrews, 1991). Self esteem is different from self concept. An individual may be able to view him/herself accurately, as to strengths, weaknesses, likes, dislikes, etc. The feelings of worth or worthlessness that the person has about these views of himself is the self esteem. Self actualization, or the attainment of one's goals, increases self esteem (Fitts, 1971). Roy and Andrews (1991) refer to this self-actualization as the self-ideal portion of self-concept.

Fitts (1965) developed an instrument that measures self-concept and self-esteem called the Tennessee Self Concept Scale. The instrument measures the following areas of self-concept in specific subscales: Self-criticism,

Identity, Self-Satisfaction, Behavior, Physical Self, Moral-Ethical Self, Personal Self, Family Self, and Social Self. These aspects of self-concept are closely related to Roy's description of self-concept (see Table 1). The Total Score, which is a compilation of the subscale scores, is the best indicator of self-esteem. Subjects may rate themselves low in individual sections of the TSCS, due to appropriate self-analysis, yet still attain a high Total Score which is indicative of a high self-esteem. Persons with low self-esteem typically rate themselves poorly overall, thus creating a low Total Score. Roy's Adaptation Model (Roy & Andrews, 1991) and Roid and Fitts (1991) define self-esteem as the individual's perception of self-worth. The TSCS, then, measures this overall feeling of self-worth in addition to self-concept.

Self concept may be affected primarily due to three things: 1) experiences, especially interpersonal, 2) competence in areas which the person or others consider valuable, and 3) self-actualization. Self concept may also influence the way in which a person acts. Throughout one's life, experiences assist in the development of the self concept (Fitts et al., 1971).

Table 1

Comparison of Definitions of Self-Concept in Roy's
Adaptation Model and the Tennessee Self-Concept Scale

Roy's Adaptation Model: Self-Concept Mode	Tennessee Self-Concept Scale: Self-Concept Divisions
<u>Physical Self</u> : Person's own image of self. Body image. Capacity to use self to perform desired behaviors.	<u>Behavior</u> : Person's perception of performance and behavior. <u>Physical Self</u> : Person's view of body, health, appearance, sexuality.
<u>Personal Self</u> : 3 divisions. 1. <u>Moral-Ethical Self</u> : judges desirability of perceptions. Evaluates person's behavior. Judges values. Spirituality. 2. <u>Self-Consistency</u> : person's behavior strives to maintain consistency of self-image. 3. <u>Self-Ideal/Self Expectancy</u> : person's expectations of behavior and self-image. Incorporates perceptions of significant others. Includes person's ideal of what he wants to become.	<u>Identity</u> : self-perceived identity. <u>Moral-Ethical Self</u> : moral worth, relationship to God, feelings of "good" or "bad" self-worth. <u>Personal Self</u> : person's sense of worth, adequacy. <u>Family Self</u> : person's feelings of adequacy, worth and value as a family member. <u>Social Self</u> : self as perceived in relation to others. Includes social interactions. <u>Self-Satisfaction</u> : How satisfied person feels with perceived self-image.
<u>Self-esteem</u> : individual's perception of self-worth.	<u>Total Score</u> : Self-esteem. Individual's perception of self-worth.
Source: Roy, 1976	Source: Roid and Fitts, 1991

Summary

Roy views nursing's goal as "the promotion of adaptation in each of the four modes, thereby contributing to the person's health, quality of life, and dying with dignity" (Roy & Andrews, 1991, p.20). Simply achieving the goal of 'saving a life' is not enough. Nurses must also be concerned with helping persons who have sustained MTBI to cope with their disabilities, and thus improve their quality of life.

The majority of the current literature supports the theory that MTBI can cause physical, emotional, and certain psycho-social problems. Although there is literature which examines depression and anxiety in patients with MTBI, no studies address the effects of MTBI on self-concept and self-esteem. Since persons who sustain MTBI may suffer sequelae, it seems likely that self-concept could also be affected.

Methods that assist persons to adapt to the sequelae associated with MTBI have been addressed very briefly in the literature. Education and reassurance appear to be beneficial, yet are not sufficient to impact the disability associated with MTBI. Rehabilitation appears to help those with MTBI, but not enough research is present to accurately evaluate this. Rehabilitation programs, both inpatient and outpatient, are an accepted and valued method of treatment for patients with moderate to severe head injuries (Ben-

Yishay et al., 1987; Do et al., 1988;, Light, Neumann, Lewis, Morecki-Oberg, Asarnow, & Satz, 1987; Ruff et al., 1989; Scleuderer et al., 1988). Since rehabilitation has been successful in patients with moderate to severe head injuries, it seems likely that cognitive rehabilitation may be equally beneficial to those patients with less severe brain injury.

Research is needed to examine adaptation to MTBI over time, and to examine the effects of rehabilitation on adaptation to the disability associated with MTBI.

Research Question

The first purpose of this study is to describe adaptation in the physiologic, role function, and self concept modes of adaptation two to five years after MTBI. The second purpose is to compare adaptation in these three modes for persons with MTBI who attended cognitive rehabilitation with those who did not.

Definition of Terms

There are many definitions of what constitutes a MTBI in the literature. The most common clinical indicators were used in this study. MTBI is defined as a head injury caused by trauma with the following symptoms: 1) LOC of 20 minutes or less or no LOC, 2) Glasgow Coma Scale scores 13 to 15, and 3) no CT scan ordered or negative results.

The Tennessee Self Concept Scale defines self concept as the way in which one sees oneself. Self esteem is the

overall feelings of self-worth that a person has about him or herself. Experiences and relationships may alter one's self concept. Persons with an overall positive self concept tend to have a good opinion about themselves, feel they have value and worth, and have confidence. Persons with negative self concepts tend to have a poor opinion about themselves, feel undesirable, and have little self confidence (Roid & Fitts, 1991).

Physiologic sequelae are defined as specific physical and emotional problems associated with MTBI to include: hearing deficit, tinnitus, dizziness, double vision, irritability, anxiety, depression, insomnia, fatigue, impaired memory, and impaired concentration.

Role function alteration is defined as a change in work status, financial status, contact with friends, number of leisure activities, and family life as perceived by the subject.

Cognitive rehabilitation is formal treatment with the goals of remediating a lost or impaired cognitive skill and/or teaching persons ways in which to compensate for cognitive impairment (Benedict, 1991). For the purpose of this study, the rehabilitation will have been conducted by occupational therapists, speech therapists, and/or physiatrists. No specific treatment will be provided; each individual's rehabilitation program will be personalized according to his or her needs. This research is concerned

only with whether or not the subjects participated in this personalized treatment.

CHAPTER 3

METHODOLOGY

Design

The research design for this study was ex post facto correlational using a survey methodology. A questionnaire was mailed to the subjects that instructed them to rate the following areas as better, the same, or worse since sustaining the mild traumatic brain injury (MTBI):

1) physiologic problems related to MTBI, and 2) role changes related to MTBI. In addition, the survey asked general demographic information and inquired if the subjects ever attended any type of retraining or rehabilitation sessions related to their MTBI. The Tennessee Self Concept Scale (TSCS) was mailed with the survey to assess adaptation in the self concept mode.

The use of a questionnaire allowed the subjects to maintain anonymity. The questionnaire also was inexpensive to use. In addition, problems such as interview bias did not affect this data-gathering procedure.

Several threats to internal validity exist. Selection may threaten the findings since the subjects who chose to attend rehabilitation sessions may be different than those who did not. In addition, persons who answered the

questionnaire may be different than those who did not. Areas in which the groups are significantly different were noted, and discussed relative to these differences.

Subjects

The clinical site used in this study is a 442 bed hospital which serves a predominantly rural area in southwest Michigan. It is designated as a Level I trauma center. Approval for using this site was obtained from the Research Review Committee at the hospital in question and Grand Valley State University.

The survey was mailed in January, 1993, to 164 persons admitted to the acute care setting during the months of October 1988 to June 1990, who had the diagnosis of MTBI on their chart, and who met the following criteria: 1) loss of consciousness (LOC) of 20 minutes or less, or no LOC, 2) Glasgow Coma Scale scores of 13 to 15, 3) no history of previous head injury or psychiatric illness, 4) greater than 15 years of age, 5) discharged to home from the acute care setting, and 6) no evidence of brain injury on computerized tomography (CT). In addition, only patients who were given a brief cognitive screening examination prior to discharge from the acute care setting were included. Sixty one subjects were female (37%) and 103 male (63%). The age ranged from 15 to 81, with a mean age of 32. Length of stay ranged from less than 24 hours to 51 days, with a mean of 6 days and a mode of 1 day. This time variance can

be attributed to other traumatic injuries the subjects sustained.

As part of a previously implemented program, patients who were admitted to the hospital with the diagnosis of MTBI are given a cognitive screening test prior to discharge by one of two occupational therapists. The cognitive screening tool is the Neurobehavioral Cognitive Status Examination (NCSE) (Kiernan, Mueller, Langston, & Van Dyke, 1987). The NCSE is a standardized tool that takes approximately 20 minutes to administer. It is comprised of test items that include verbal answers and manual skills. It assesses level of consciousness, orientation, attention, language, visual construction, verbal memory, calculation, and verbal memory. For the purpose of this study, the test was scored as positive if the subject scored below the normal range in the status profile portion of the exam. A negative score indicated above average or average scoring on the status profile portion. Sixty subjects (37%) had cognitive deficits identified by the NCSE done prior to discharge. The remaining 104 subjects (63.4%) scored within the standardized normal range. Some patients with deficits on the cognitive screen were referred for outpatient cognitive evaluations after discharge. This evaluation consisted of a more comprehensive battery of cognitive testing. Outpatient cognitive evaluations were done on 41 subjects, with 35 showing cognitive deficits, and six showing no deficits.

Cognitive rehabilitation was usually prescribed for subjects with cognitive deficits identified during the cognitive evaluation. Patients sometimes chose not to attend the prescribed cognitive rehabilitation.

Instruments

Data collection involved chart review followed by mailing a two-part questionnaire. Chart review was done on all patients admitted to the hospital with a diagnosis of MTBI during the months of October 1988 to June 1990. This provided data needed to determine patients' eligibility for inclusion in the study in addition to further demographic data. Information obtained from the chart included the following: Date of admission, date of discharge, age, Glasgow Coma Scale Scores, length of loss of consciousness, CT scan results, sex, mechanism of injury, cognitive screen results, previous history of psychiatric problems or head injury, and cognitive evaluation results.

A questionnaire was sent to the subjects. The first part of the questionnaire, a survey adapted from Edna (1987) (see Appendix A), was used to assess adaptation in the physiologic and role function mode. Questions regarding work history prior to and after the head injury and past history of head injury, were included. A social scale was computed by adding questions 12 through 15 on the survey. Subjects were asked to rate contact with friends, family life, income, and leisure activities as "better than" (3

points), "the same" (2 points), or "worse than" (1 point) the head injury. The maximum score possible was 12, indicating "better than" in all areas. The minimum score possible was 4, indicating worse than in all areas.

Subjects were asked to identify symptoms from a list that they exhibited prior to the head injury and after the head injury. The new symptoms were those symptoms subjects had only after the head injury. This provided for both nominal and interval measurement since the number of symptoms subjects complained of as well as specific symptoms can be used in statistical analysis. Edna did not report validity or reliability data. However, the questionnaire includes all appropriate symptoms and sequelae based on current literature. Thus, content validity can be assumed.

Tennessee Self Concept Scale. The second part of the questionnaire consisted of the Tennessee Self Concept Scale (Roid & Fitts, 1991). This was used to assess adaptation in the self concept mode. This instrument was developed by Fitts in 1956 and used extensively for counseling and research to measure self-concept. Two forms are available for use. These are the counseling form and the research form. For the purpose of this study, the counseling form was used as it is the best form to assess the self concept mode as defined in this study. This is a self-administered scale, which consists of 100 questions. A five point scale is used for scoring the answers, with answers scored as 1)

completely false, 2) mostly false, 3) partly false and partly true, 4) mostly true, and 5) completely true. The TSCS includes subscales on the following areas of self-concept: Identity, Self-Satisfaction, Behavior, Physical Self, Moral-Ethical Self, Personal Self, Family Self, Social Self, and the Total Score (Table 2). Scores are calculated for each area by adding the responses to appropriate items. Some items are used in more than one subscale. The questionnaire is based on a fourth grade reading level and takes 10 to 20 minutes to complete.

Scoring of the TSCS is done by obtaining cumulative scores for each subscale and the total score. The results can be plotted on a graph, which visually depicts each area. Normalized T-scores for each scale are used to determine which scores are very low, low, below average, average, above average, high or very high. Table 3 depicts the T-score ranges and performance meanings used. Table 4 describes the range of raw scores for each subscale.

Table 2

TSCS Subscale Descriptions

Subscale	Number of items	Description
Physical Self	18	Persons view of their body, state of health, physical appearance, skills, sexuality
Moral Ethical	18	Self from a moral ethical frame, moral worth, relation to God, feelings of good or bad.
Personal Self	18	Sense of personal worth, adequacy, evaluation of personality
Family Self	18	Feelings of adequacy, worth, value as a family member.
Social Self	18	Self as perceived in relation to others.
Identity	30	"What am I?", self perceived identity
Self Satisfaction	30	How satisfied person feels about self image, Self acceptance
Behavior	30	"What I do", perception of behavior and how person functions
Total Score	90	Overall self esteem

Source: Roid & Fitts, 1991

Table 3

Scoring of TSCS

Range	Meaning
20T-25T	Very low
25T-35T	Low
35T-45T	Below Average
45T-55T	Average
55T-65T	Above Average
65T-75T	High
75T-80T	Very High

Source: Roid & Fitts, 1991

The TSCS manual provides data on the test-retest reliability of the tool. Archived data were collected from studies with control groups who were given the TSCS as a pre-test and post-test. The test-retest intervals ranged from 2 hours to 10 weeks. The samples included 3 groups of adolescents, one group of college students, and a group of adults. The mean standardized differences was $-.016$, indicating little change over time. Fitts (1965) reported test-retest reliability for 60 college students over a two week period. The reliability coefficients for all subscales ranged from $.60$ (row variability) to $.92$ (Total Score). Although this is a wide range, it is to be expected with

Table 4

Raw Score Ranges for T-Score Conversion for TSCS Subscales

<u>TSCS Subscale</u>	<u>Raw Scores Ranges for T-Score Conversion</u>						
	Very Low	Low	Below	Average	Above Average	High	Very High
Identity	91-98	99-113	114-122	123-133	134-140	141-147	148-149
Self Satisfaction	54-62	63-82	83-98	99-111	112-124	125-135	136-150
Behavior	76-83	84-99	100-110	110-120	121-131	132-141	142-144
Physical Self	48-52	53-59	60-69	70-75	76-82	83-88	89-90
Moral-Ethical Self	45-50	51-59	60-67	68-74	75-83	84-88	89-90
Personal Self	38-43	44-54	55-61	62-68	69-75	76-82	83-90
Family Self	43-50	51-59	60-66	67-75	76-82	83-87	88-90
Social Self	42-47	48-56	57-64	65-72	73-80	81-86	87-90
Total Score	220-250	251-300	301-333	334-365	366-390	391-417	418-440

college students who are typically still in the process of developing their self-concept. These results are summarized in Table 5 (Roid & Fitts, 1991).

Table 5

TSCS: Reliability Data

Subscale	Internal Consistency Reliability	Test-Retest Reliability
Physical Self	.81	.87
Moral-Ethical	.84	.80
Personal Self	.82	.85
Family Self	.82	.89
Social Self	.82	.90
Identity	.86	.91
Self Satisfaction	.87	.88
Behavior	.85	.88
Total Score	.94	.92

Source: Roid & Fitts, 1991

In addition, a comprehensive study of 472 subjects, age 13 and older, was performed to study the internal consistency of the TSCS profile scales. The mean age of the subjects was 26.95 years. Chronbach's alpha coefficients were calculated on the entire scale and subscales. The majority of the Chronbach's alpha coefficients ranged from

.70 to .87. The Total Score had the highest values (.91 - .94) (Roid & Fitts, 1991) (Table 5).

The TSCS total score results have been correlated with many other instruments to obtain construct validity. Two-hundred and four undergraduate college students were given both the Coopersmith Self Esteem Inventory and the TSCS. The correlation between these two scales was .63 (Van Tuinen & Ramanaiah, 1979). Although self-esteem and self concept are two different measures, the TSCS does measure self esteem in the form of the total score. Yonker, Blixt and Dinero (1974) reported correlations of .51 (males) to .61 (females) with the Piers-Harris Children's Self-Concept Scale with 208 tenth grade students.

There are studies which examine the ability of the TSCS to measure changes in self-concept after an intervention. Ashcraft and Fitts (1964) studied the effects of psychotherapy on TSCS scores. Two groups were studied. One group had been in therapy for approximately 6 months. The other group had not had therapy. Both groups were tested on a pre-test post-test basis. The therapy group showed improvement in self-concept in 18 of 22 variables studied (Roid & Fitts, 1991).

Procedure

Subjects were selected from information provided on the trauma registry at the clinical site and through chart review. Selected chart data were collected on a separate

form coded with a matching number. Subjects who met the criteria were given a number that appeared on the questionnaires to maintain confidentiality. The questionnaire was sent with a cover letter (Appendix B) to each subject. The cover letter explained the purpose of the study in general terms and assured confidentiality. The cover letter explained that return of the questionnaire indicated permission to use the data provided in the questionnaire and chart review. A stamped, addressed return envelope was included with the questionnaire. To encourage subject response, follow-up reminders were sent 10 days after the first mailing to subjects who did not reply. The survey was again sent 3 weeks later to all subjects who did not respond to the first mailing and follow-up reminder.

Human subjects protection criteria were approved by Grand Valley State University and the hospital's research committee.

This research design had minimal risk for the subjects. Confidentiality was the greatest potential risk. To reduce this risk, the questionnaires were numbered. The data are reported as aggregate data only. No names are attached to the data. The mailing list was destroyed at the completion of the study.

CHAPTER 4

RESULTS

Sample Demographics

Completed questionnaires were returned by 66 subjects (40% of the 164 mailed) 32 to 64 months after their head injury. Twenty-nine were female (44%) and 37 were male (56%). The age at time of injury for the respondents ranged from 15 to 81 years, with a mean age of 35 years. The mechanism of injury is summarized in Table 6. Length of

Table 6

Mechanism of Injury

Mechanism	<u>n</u> (%)
Motor vehicle crashes	49 (74%)
Falls	6 (9%)
Motor cycle crashes	5 (8%)
Assault	2 (3%)
Other	2 (3%)
Pedestrian struck	1 (1.5%)
Bicycle accident	1 (1.5%)

hospital stay ranged from less than 24 hours to 48 days, with a mean of seven days and a mode of one day. Cognitive deficits were identified in 26 subjects (39%) by the Neurobehavioral Cognitive Status Examination (NCSE). Forty subjects (61%) did not have cognitive deficits identified by the NCSE. Post discharge cognitive evaluations were done on 18 subjects (27%). Sixteen indicated continued cognitive deficits and two were functioning within normal limits.

The sample was divided into three groups to determine differences between the groups. These included: a) subjects who completed and returned the questionnaire (n=66), b) subjects who returned the questionnaire but left it blank, choosing not to participate in the study (n=11), and c) subjects who were not located or who did not return the questionnaire (n=86) (Table 7). The groups were not significantly different in respect to sex ($X^2=1.478$, $p=.13021$), inpatient cognitive screen results ($X^2 = 5.645$, $p=.68726$), or LOS (ANOVA, $F =1.4136$, $p>.05$).

Adaptation

The first purpose of this study was to examine adaptation in the physiologic, role function, and self concept modes of adaptation two to five years after mild traumatic brain injury (MTBI).

Physiologic Mode. Subjects were asked to identify symptoms from a list of 11 possible symptoms that they had prior to their head injury and those that they had in the

Table 7

Comparison of Subjects Related to Disposition of Survey

Criteria	<u>Disposition of Survey</u>		
	Completed n(%)	Blank n(%)	Not returned n(%)
Sex:			
Male	37 (56%)	10 (91%)	56 (64%)
Female	29 (44%)	1 (9%)	31 (36%)
NCSE Results:			
Positive	26 (39%)	5 (46%)	29 (33%)
Negative	40 (61%)	6 (54%)	58 (67%)
LOS	7.2 days	6.2 days	5.3 days

last two months. The number of new symptoms (symptoms present in the last two months but not prior to their head injury) ranged from zero to 11, with 35 subjects (53%) reporting at least one new symptom. These results are summarized in Table 8.

Role function. Fifty-five subjects stated they had a regular job prior to their head injury, with hours per week worked ranging from zero to 80 (mean = 37 hours). Fifty subjects stated they were currently working, with the hours per week ranging from zero to 80 (mean = 35 hours). Five persons were no longer employed. A paired t-test was done

to assess for differences in the number of hours worked for the subjects who remained employed (n = 50). There was no significant difference in hours worked pre and post injury ($t=0.96$, $p=.34$).

Table 8

New Symptoms

Symptom	<u>Years after MTBI</u>			
	Whole group	2-3	3-4	4-5
	n(%)	n(%)	n(%)	n(%)
	n=66	n=22	n=35	n=9
Memory problems	22 (33%)	8 (36%)	13 (37%)	1 (11%)
Tiredness	19 (29%)	6 (27%)	11 (31%)	2 (22%)
Depression	18 (27%)	8 (27%)	9 (26%)	1 (11%)
Concentration	17 (26%)	8 (27%)	8 (23%)	1 (11%)
Sleeping problems	17 (26%)	7 (32%)	9 (26%)	1 (11%)
Dizziness	16 (24%)	7 (32%)	8 (23%)	1 (11%)
Anxiety	14 (21%)	7 (32%)	5 (14%)	2 (22%)
Irritability to noise or light	11 (17%)	5 (23%)	6 (17%)	0
Tinnitus	9 (14%)	3 (14%)	5 (14%)	1 (11%)
Diplopia	8 (12%)	3 (14%)	4 (11%)	1 (11%)
Hearing difficulties	4 (6%)	2 (9%)	2 (6%)	0

Note: Subjects may have identified multiple symptoms

Subjects were asked to state the amount of sick time

(in weeks) they took from their job in the year prior to their head injury and in the past year. Forty-one subjects (78.8%) indicated they had taken less than one week of sick time the year prior to their head injury. The remaining 11 subjects took from one to 15 weeks off. Analysis using a paired t-test showed no significant difference between the sick time taken in the year prior to the head injury (mean=.71 weeks) and in the past year (mean=.78 weeks) ($t=-0.15$, $p=.879$).

The social scale was computed by adding questions 12 through 15 on the survey. Subjects rated their current role performance in the stated areas as "better than" (3 points), "the same as" (2 points) or "worse than" (1 point) before the head injury. The scores ranged from 4 to 12, with a mean of 7.8. This is exhibited in Table 9.

Table 9

Social Scale

Social Scale Item	(n)	Scoring		
		Better n(%)	Same n(%)	Worse n(%)
Contact with friends	(65)	4 (6%)	50 (77%)	11 (17%)
Family life	(65)	12 (19%)	43 (66%)	10 (15%)
Income	(65)	18 (28%)	32 (49%)	15 (23%)
Leisure activities	(64)	10 (16%)	36 (56%)	18 (28%)

A (2-tailed) correlation was done between number of

new symptoms and the social score. A moderate negative relationship between symptoms and social score was found ($r = -.59$, $p = .001$).

Self Concept The TSCS subscale and total scores were calculated for the sample. The mean scores are listed in Table 10. Four subscales were in the below average range. A frequency distribution of respondents' scores by T-score ranges for each subscale is listed in Table 11.

Table 10

TSCS Subscale Mean Scores and T-Score Conversions

Subscale	Mean Raw Score	T-Score Conversion
Identity	118	40T *
Self-Satisfaction	108	52T
Behavior	109	44T *
Physical Self	64	40T *
Moral-Ethical Self	67	44T *
Personal Self	65	50T
Family Self	70	49T
Social Self	69	51T
Total Score	336	46T

Note: the T-score refers to normalized T-score ranges for the TSCS

* Below average

Table 11

Analysis of Individual Score Ranges on the TSCS Subscales

<u>TSCS Subscale</u>	<u>N(%) for each T-Score Range</u>							Missing
	Very Low	Low	Below	Average	Above Average	High	Very High	
Identity	3(5%)	14(24%)	21(36%)	19(33%)	1(2%)	0	0	8
Self Satisfaction	1(2%)	5(9%)	9(15%)	18(32%)	15(26%)	4(7%)	5(9%)	10
Behavior	1(2%)	13(21%)	16(27%)	16(27%)	8(13%)	5(8%)	1(2%)	6
Physical Self	7(11%)	9(15%)	25(41%)	13(21%)	6(10%)	1(2%)	0	6
Moral Ethical	3(5%)	8(14%)	16(27%)	22(37%)	10(17%)	0	0	7
Personal Self	3(5%)	5(8%)	13(21%)	22(35%)	8(13%)	10(16%)	1(2%)	4
Family Self	5(9%)	4(7%)	9(15%)	24(40%)	13(22%)	3(5%)	1(2%)	7
Social Self	1(2%)	5(9%)	9(15%)	22(33%)	12(20%)	8(13%)	2(3%)	7
Total Score	1(2%)	7(13%)	15(29%)	17(33%)	7(13%)	5(10%)	0	14

Note: Missing data refers to incomplete subscale scores due to one or more questions not answered.

A correlation analysis was done using the following variables: TSCS subscale scores, the number of new symptoms reported, the length of hospital stay, the social score and age. Age and length of hospital stay did not significantly correlate with any subscales. There were statistically significant correlations with the number of new symptoms and the following TSCS scales: Physical Self ($r = -.55$, $p = .001$), Personal Self ($r = -.39$, $p = .01$), Identity ($r = -.39$, $p = .01$), Social Self ($r = -.37$, $p = .01$), Self Satisfaction ($r = -.42$, $p = .01$), and the Total Score ($r = -.43$, $p = .01$). The social score correlated positively with all of the TSCS subscales with the following values: Physical Self ($r = .56$, $p = .001$), Moral Ethical Self ($r = .42$, $p = .01$), Personal Self ($r = .72$, $p = .001$), Family Self ($r = .60$, $p = .001$), Identity ($r = .56$, $p = .001$), Self Satisfaction ($r = .63$, $p = .001$), and Behavior ($r = .76$, $p = .001$), and the Total Score ($r = .82$, $p = .001$).

Rehabilitation

The second purpose of this study was to compare physical symptoms, role function, and self concept for the subjects who attended cognitive rehabilitation with those who did not. Forty-eight subjects denied being referred for cognitive rehabilitation (75%). Sixteen subjects (25%) identified that they were referred for outpatient cognitive rehabilitation sessions for their head injury symptoms, of these fifteen (23%) attended and one subject did not. Two

persons did not indicate whether they had been prescribed or had attended rehabilitation, therefore they were excluded from this analysis.

The researcher intended to analyze differences in persons who were prescribed rehabilitation but chose not to attend; however, only one subject fit this profile. Therefore, two groups, the rehabilitation and non-rehabilitation subgroups, were analyzed. Table 12 shows a comparison of the rehabilitated and non-rehabilitated subjects. Analysis using t-test showed no significant differences between the groups with respect to age ($t=0.46$, $p=.645$) or LOS ($t=0.06$, $p=.955$). However, chi square analysis showed some significant differences in respect to cognitive screen results, with 73% of the subjects who attended rehabilitation having a positive score on the inpatient NCSE, versus only 29% of the non-rehabilitation group ($X^2=9.67$, $p=.001$). Cognitive evaluation results, obtained from chart review, were also significantly different between the groups ($X^2=20.95$, $p=.001$), with 67% of the subjects who attended rehabilitation having positive cognitive evaluations, and no persons with negative cognitive evaluations attending rehabilitation. These differences are not surprising, as the NCSE and cognitive evaluation are tools used to refer persons for rehabilitation.

Table 12

Comparison of Subjects With and Without Rehabilitation

Criteria	Rehabilitated Group	Non-rehabilitated
	n(%)	n(%)
	n=15	n=49
Sex: Male	10 (67%)	25 (51%)
Female	5 (33%)	24 (49%)
Mean Age	34 years	36 years
LOS	7.3 days	7.1 days
NCSE results:		
Positive	11 (73%)	14 (29%)
Negative	4 (27%)	35 (71%)
Cognitive Evaluation		
Positive	10 (67%)	5 (10%)
Negative	0	2 (4%)
No data	5 (33%)	41 (86%)

Physiologic Mode. New symptoms were analyzed for persons who attended and did not attend rehabilitation sessions. Chi-square analysis was done to determine which new symptoms were significantly different between the groups. There was no significant differences between the groups for any symptoms except memory ($X^2=5.72$, $p=.02$), with 9 subjects (60%) in the rehabilitated group complaining of

memory problems, and 13 (27%) in the non-rehabilitated group. The mean number of new symptoms for each group was analyzed with a t-test, with no statistically significant results (mean symptoms rehab = 3.4, non-rehab = 2.1; $t=1.62$, $p=.111$).

Role function. The social score was calculated for persons who received and did not receive rehabilitation. A t-test was done between the groups, with no statistically significant differences (mean rehab= 7.0, non-rehab=8.1; $t=1.46$, $p=.163$). A chi-square test was done on each role function area to analyze the difference between the groups in responses. Significant differences were noted in the areas of family life and income, with the rehabilitated group showing a more negative trend in their responses. The data are further described in tables 13 through 16.

There was no significant difference in current employment between the rehabilitated and not rehabilitated subjects, with 60% of the rehabilitated group and 82% of the non-rehabilitated group employed ($\chi^2=2.995$, $p=.08$). Number of hours worked prior to head injury for the rehabilitated (mean = 41 hours) and non-rehabilitated group (mean = 37 hours) were not significantly different ($t=0.70$, $p=.486$). Hours currently worked were also not significantly different with the rehabilitated group working a mean of 29.8 hours, and the non-rehabilitated group working a mean of 36.3 hours ($t=-1.19$, $p=.239$). Amount of sick time taken from work

during the past year was also not statistically different between the rehabilitated (mean = 0.18 weeks) and non-rehabilitated subjects (mean = 1.3 weeks) ($t=-0.94$, $p=.349$).

Chi-square analysis showed a significant difference in physical activity between the groups ($\chi^2=3.7804$, $p=.05$). Sixty percent of the rehabilitated subjects stated they were

Table 13

Contact With Friends: With and Without Rehabilitation

Group	(n)	Better n(%)	Same as before n(%)	Worse n(%)
Rehab	(15)	1 (7%)	8 (53%)	6 (40%)
Non-rehab	(49)	3 (6%)	41 (84%)	5 (10%)

($\chi^2=7.318$, $p=.025$)

Table 14

Family Life: With and Without Rehabilitation

Groups	(n)	Better n(%)	Same as before n(%)	Worse n(%)
Rehab	(15)	3 (20%)	6 (40%)	6 (40%)
Non-rehab	(49)	9 (18%)	36 (74%)	4 (8%)

($\chi^2=9.426$, $p=.009$)

Table 15

Income: With and Without Rehabilitation

Groups	(n)	Better	Same as before	Worse
		n(%)	n(%)	n(%)
Rehab	(15)	4 (27%)	6 (40%)	5 (33%)
Non-rehab	(49)	14 (29%)	25 (51%)	10 (20%)

($X^2=1.121$, $p=.570$)

Table 16

Leisure Activities: With and Without Rehabilitation

Groups	(n)	Better	Same as before	Worse
		n(%)	n(%)	n(%)
Rehab	(14)	2 (14%)	5 (36%)	7 (50%)
Non-rehab	(49)	8 (16%)	31 (63%)	10 (21%)

($X^2=5.008$, $p=.081$)

less physically active than before their head injury, versus 18% of the non-rehabilitation group.

Self Concept. TSCS mean scores were calculated for subjects who attended and did not attend rehabilitation sessions. The rehabilitated group scored lower on all of the subscales. A t-test was used to determine if the mean

scores of the subscale and total scores were significantly different between these two subgroups. Results showed five subscales were significantly different between the two groups. One subscale approached significance. These results are summarized in Table 17.

Table 17

Comparison of Mean TSCS Scores for Rehabilitated and Non-rehabilitated Subjects

<u>Subscale</u>	<u>Rehab</u>		<u>Non-Rehab</u>		<u>t-value</u>	<u>p-value</u>
	Raw	T	Raw	T		
Identity	116	39T	120	40T	-1.24	.219
Self-						
Satisfaction	94	44T	111	54T	-2.83	.007*
Behavior	103	38T	112	47T	-2.00	.05*
Physical Self	61	37T	65	41T	-1.58	.119
Moral-Ethical	64	41T	68	47T	-1.60	.116
Personal Self	59	43T	66	51T	-2.67	.01*
Family Self	66	44T	72	51T	-1.96	.055
Social Self	64	42T	71	50T	-2.32	.024*
Total Score	314	39T	343	48T	-2.27	.027*

* statistically significant

CHAPTER 5

DISCUSSION

Roy's adaptation model provided an excellent framework for analyzing the long term effects of mild traumatic brain injury (MTBI). The results of this study indicate that persons with MTBI are at risk for having decreased self concept and multiple physical symptoms for an extended time after their injury.

Adaptation

Adaptation to MTBI was analyzed in the physiologic, role function and self concept modes.

Physiologic Mode. Subjects experienced many different symptoms, with over half experiencing at least one new symptom since their head injury. One third of the group complained of memory difficulties. Tiredness, depression, concentration difficulties, and dizziness were also frequently reported symptoms. Many of the studies discussed in the literature review also identified these symptoms as being present in some persons after MTBI, however, most of the studies were done weeks or a few months, not years, after MTBI. This suggests that the sequelae persons sustain after MTBI may be of a more permanent nature. A greater number of new symptoms was related to a worse social score

and some lower TSCS subscale means. These data once again support the need for educating persons with MTBI about the possible sequelae. In addition, nurses and other medical personnel need to be aware of the possible permanent effects of MTBI.

Role Function. The results of this study did not indicate that MTBI significantly affects role function. No significant differences before and after the head injury in relation to employment or hours worked were identified. In addition, there were no significant findings in the social scale. The results indicate that persons with MTBI maintain employment. However, there was an inverse relationship between the number of new symptoms and the social scale. This suggests that persons with multiple symptoms may have difficulties in the role function mode. No data were collected regarding type of employment before and after head injury. In addition, data concerning difficulties with work performance were not collected.

Self Concept. The study subjects had a below average self concept in several areas. The Tennessee Self Concept Scale (TSCS) identified below average mean scores in the areas of physical self, identity, moral self, and behavior. Factors which appeared to be related to lower TSCS subscale scores included the number of new symptoms reported, the social score, and rehabilitation. More new symptoms were correlated with several lower TSCS subscale scores. Higher

social scores were correlated with higher TSCS subscale scores.

Rehabilitation

Adaptation in the 3 adaptive modes was analyzed for persons who attended cognitive rehabilitation and those who did not.

Physiologic Mode. Subjects who attended rehabilitation were significantly different from those who did not in respect to physical symptoms. The rehabilitated group had significantly more memory problems. In addition, the rehabilitated subjects reported more new symptoms, although this was not statistically significant. It is likely that the rehabilitated group had more severe symptoms, at least initially, since they had more positive inpatient cognitive screen results and more positive cognitive evaluation results.

Role Function. Subjects who attended rehabilitation were not significantly different from those who did not with respect to the social score, employment, number of hours worked, and sick time. However, the general trend was for subjects who attended rehabilitation to have more unemployment, to work fewer hours, and to rate themselves lower on the social scale.

Although the social scores were not significantly different between the groups, there was a significant difference in answers on the social scale items of family

life and contact with friends. The non-rehabilitated group tended to answer "same as before" much more often. The rehabilitated group tended to answer "worse than before" the head injury much more often. It is interesting that these two areas relate to interpersonal relationships. It is possible that the rehabilitated subjects' physical problems are difficult for family and friends to tolerate after a certain period of time. MTBI is an injury that can not be seen externally. There is no victory associated with overcoming the obstacles MTBI persons may face. Due to the lack of knowledge about the long term effects of MTBI, family and friends may not be as patient and supportive of the individual with MTBI.

One other factor that could be related to impaired role function in the rehabilitated subjects include location of injury. Certain brain injury locations could alter the individual's ability to function in social relationships. For instance, persons with frontal lobe head injuries can have impaired judgment, impulsivity, and a change in personality. Without efforts at describing the specific location of the injury clinically, it is difficult to determine how this might affect MTBI clients in the long term.

Self Concept. Subjects who attended rehabilitation sessions had lower mean TSCS scores in all subscales than those who did not attend rehabilitation. The rehabilitated

subjects scored below average in all TSCS subscales. There was a significant difference between the rehabilitated and non-rehabilitated groups in the subscales of social self, self satisfaction, behavior, personal self, and the total score. The non-rehabilitated group scored average in all areas except for identity and physical self, which were in the below average range.

Although some studies have found that persons who attend rehabilitation for other types of disabilities have an above average self-concept (Yates & Belknap, 1991; Green, Pratt & Grigsby, 1984), this did not occur in this study. The rehabilitated subjects had more physical problems, and some difficulty with role function when compared to the non-rehabilitated group. These factors could influence the individual's view of him or herself. If the head injury symptoms are severe enough, it is possible that this could inhibit the individual's ability to attain his or her goals. Combined with that, problems with interpersonal relationships could make the individual feel alone and unsupported and not worth being loved.

It is interesting that the social scales were not significantly different between the rehabilitated and non-rehabilitated groups, yet the portion of the TSCS measuring "social-self" was significantly worse for persons who had attended rehabilitation sessions. The social score looked at income, family life, leisure activities, and contact with

friends. The Social Self subscale on the TSCS measured the subject's view of his or her relationships with others outside of the family. When the individual items on the social scale were analyzed, rehabilitated subjects indicated statistically different scoring in the areas of family life and contact with friends, indicating worse functioning in these areas. Thus, the TSCS item of Social Self is congruent with the social scale item of contact with friends. This gives added support to the indication that the rehabilitated subjects have difficulty with interpersonal relationships.

Limitations

Sample. The sample size was relatively small, especially the rehabilitated sub-group. In addition, the sample came from one institution. All of the subjects were hospitalized. The definition of MTBI is varied from study to study, thus this parochial definition may not be generalizable. Persons with MTBI who do not require hospitalization may be different from this sample. Subjects who returned the survey may be different from those who did not. Therefore, the sample might not be representative of the MTBI population. This limits the generalizability of the study results.

The researcher originally intended to analyze the differences in subjects who were referred for rehabilitation but chose not to attend. This would have helped control for

possible differences in the subjects who were rehabilitated. However, only one subject fit this criterion. Therefore, it was not possible to include this sub-sample as a separate group for comparison in the study.

Instruments. The study design was ex-post facto correlational with a survey methodology. The survey asked the subjects to remember the presence of symptoms prior to their head injury; this could influence self-report reliability. Subjects may not accurately remember their health status prior to their head injury. If the subjects do suffer from impaired cognitive abilities related to their head injury, this could affect the reliability of their survey answers. Subjects may have deliberately tried to make themselves appear better or worse on the survey.

The subjects were asked if they had returned to work and the hours worked. Changes in the type of work were not identified. It was not possible to identify if the subjects were working in a comparable job or one more or less challenging. Difficulties with work were also not analyzed. It is possible that subjects had to take a less challenging job, or had trouble working at their previous level.

The social score was not very informative. It was based on 4 questions, which the subject was asked to rate "worse than," "the same as before," or "better than" after their head injury. The items rated as "worse than" received 1 point, "same as before" 2 points, and "better than" 3

points. The total score available ranged from 4 to 12 points. The scoring did not help to determine which subjects had deficits in social functioning, since it was not clear what score was average. Averaging the social score also did not take into account for specific areas subjects rated as "worse than." A standardized tool that measures specific role function areas would have improved the study design.

Methods. The survey return rate was low (40%), mostly due to lack of current addresses. Some questions were left unanswered, which further limited the data available. Persons with reading, writing, or cognitive problems might not have been able to answer the survey. This may have introduced bias.

It is not possible to determine if the results of the TSCS are a result of the MTBI or of other factors. It is conceivable that persons with low self-concepts may be more likely to involve themselves in activities that could cause MTBI, so that the self concept is not a result of the trauma.

The survey relied on the subjects' identification of whether or not they had attended rehabilitation for their head injuries. The type of rehabilitation subjects received was not identified. The rehabilitation program could have lasted any length of time. Subjects could have attended a short rehabilitation program, yet not be aware that the

rehabilitation was for their MTBI. The type of rehabilitation could be a significant factor in the head injured person's recovery.

The study would have been stronger with a control group for comparison. The economy, subjects, aging, other health related problems and multiple other factors could have influenced the survey results. A control group could have helped to determine which of the results was unique to the MTBI subjects.

Statistical analysis. The sample sizes were smaller than desirable for inferential statistical analysis. This could influence the validity of the results. The first part of the questionnaire was mostly limited to nominal level data, which limited the type of statistics used. Since mostly descriptive statistics were used to report the data, no causal relationships can be identified.

Future studies

It would be interesting to further research the effects of rehabilitation on persons with MTBI. Use of a random sample and a prospective design would enhance the study. Specifically, it would be informative to analyze specific rehabilitation strategies as to their success at returning persons with MTBI to their normal activities with the least amount of difficulties. Since self concept was negatively affected in this MTBI sample, it is essential that different methods of addressing self concept for this population are

studied. It would be informative to study the effects of support groups for the patient and family or significant others on the psycho-social recovery of persons with MTBI.

It would benefit future MTBI research to focus on a standard definition of MTBI. This would make the findings more generalizable. Since the completion of this study, a definition of MTBI has been developed by the Mild Traumatic Brain Injury Committee of the Head Injury Interdisciplinary Special Interest Group of the American Congress of Rehabilitation Medicine (1993, p. 86). This definition states that MTBI has one of the following: 1) any period of loss of consciousness; 2) any loss of memory for events immediately before or after the accident; 3) any altered mental state; and 4) focal neurologic deficits that may or not be transient. The severity of the injury can not include LOC of more than 30 minutes, Glasgow Coma Scale scores of less than 13 after 30 minutes post injury, and posttraumatic amnesia of more than 24 hours. This definition is clinically applicable, since no detailed neurologic exams must occur to define MTBI. It may be difficult to obtain records of length of posttraumatic amnesia. As researchers and clinicians that work with MTBI clients become aware of this definition, these criteria need to be applied to the records so appropriate research and care can be delivered.

It would be interesting to repeat the study, using a

larger, randomized sample taken from multiple institutions. The inclusion of persons with MTBI who do not require hospitalization could add to the study. It would be informative to analyze the symptoms over time to see if improvement occurs. In addition, a standardized tool to measure role function would be beneficial.

Conclusion

Persons with MTBI are at risk for developing long term, possibly permanent, problems with physical symptoms, role functioning, and self concept. Rehabilitation programs need to identify and address physical problems and self concept concerns. Education and support groups for family and significant others need to be available. Persons with deficits who continue to attempt to return to their normal functioning unsuccessfully after mild traumatic brain injury are at risk for continued problems with self concept. It is possible that early identification of problems, patient and family education and supportive counseling may help to combat the problems with self concept some persons experience.

Nursing has an important role in the identification and treatment of persons with problems associated with MTBI. The long term problems associated with MTBI need to be included in nursing education, so that nurses can recognize MTBI sequelae and intervene appropriately. It is imperative that nurses are aware of the importance of educating

patients about the possible effects of MTBI sequelae prior to sending the patient home. Nurses who care for patients with MTBI need to know the resources available in their area for medical treatment, rehabilitation, and psycho-social support.

Nurses who care for MTBI patients need to develop inpatient education programs for MTBI patients and their families. Patients and their significant others should be sent home with verbal and written instructions regarding potential problems and available resources. In addition, outpatient nursing follow-up programs for patients with MTBI should be implemented so that referrals are made when problems are suspected. Finally, it is imperative that a multidisciplinary approach be taken towards the care of persons with MTBI. Nurses, neuropsychologists, physiatrists, psychologists, and rehabilitation therapists have important roles in the identification, treatment, and long term resource availability for persons with MTBI.

Appendicies

Appendix A

Survey

Questionnaire

Please answer the following questions by checking "yes" or "no" or writing in the answer in the space provided.

1. Were you in the hospital with a head injury before 1988?.....Yes__ No__
2. Were you in the hospital with a head injury after 1990?..... Yes__No__
3. How many times have you been admitted to the hospital with a head injury?..... __times
4. How many times have you been treated by a doctor for a head injury without being admitted to a hospital?.....__times
5. How many weeks have you taken sick leave from your job for any reason since January 1, 1992.....__weeks
6. Did you have a regular job before your head injury obtained in 1988 - 1990 (if you are a housewife or student, consider that your job).....Yes__ No__
7. If you answered "yes" to number 6, how many hours per week did you work?..... __hours
8. If you answered "yes" to number 6, how many weeks of sick leave did you take from your job in the year before your head injury in 1988 - 1990?..... __weeks
9. Are you now working?.....Yes__ No__
10. If you answered "yes" to number 9, how many hours per week do you work?..... __hours
11. Are you less physically active since your head injury in 1988 - 1990?..... Yes__ No__

Rate the following situations as "better", "the same as before", or "worse" since your head injury in 1988 - 1990:

	<u>Better Than</u>	<u>As before</u>	<u>Worse</u>
12. Contact with friends:	_____	_____	_____
13. Family life:	_____	_____	_____
14. Your income:	_____	_____	_____
15. Number of leisure activities:	_____	_____	_____

Please check "yes" or "no" if you have had any of the following symptoms:

<u>BEFORE the head injury</u> Did you have any of the symptoms listed below 2 months before you had your head injury?		<u>AFTER the head injury</u> Have you had any of the symptoms listed below in the last 2 months?	
16. Hearing deficit?	yes___ no___ (37)	17. yes___ no___ (38)	
18. Ringing in the ears?	yes___ no___ (39)	19. yes___ no___ (40)	
20. Dizziness?	yes___ no___ (41)	21. yes___ no___ (42)	
22. Double vision?	yes___ no___ (43)	23. yes___ no___ (44)	
24. Irritability to noise or light?	yes___ no___ (45)	25. yes___ no___ (46)	
26. Anxiety?	yes___ no___ (47)	27. yes___ no___ (48)	
28. Depression?	yes___ no___ (49)	29. yes___ no___ (50)	
30. Trouble sleeping?	yes___ no___ (51)	31. yes___ no___ (52)	
32. Tiredness?	yes___ no___ (53)	33. yes___ no___ (54)	
34. Trouble remembering?	yes___ no___ (55)	35. yes___ no___ (56)	
36. Trouble with concentration?	yes___ no___ (57)	37. yes___ no___ (58)	
<hr/>			
38. Were you ever advised to attend outpatient rehabilitation sessions due to your head injury? (due to head injury only).....	yes___	no___	(60)
39. Did you ever attend outpatient rehabilitation sessions due to your head injury?.....	yes___	no___	(61)
40. If you were advised to attend rehabilitation sessions, but did not, why did you not attend them? (please check one or more) transportation problems___ money problems___ didn't think I needed___ other___			(62)

Information on the Tennessee Self Concept Scale can be obtained by contacting the following publisher:

Western Psychological Services

12031 Wilshire Boulevard

Los Angeles, California 90025-1251

Appendix B

Cover Letter

February 1, 1993

Dear _____

Over 7 million people obtain a head injury yearly. Most head injuries are caused by accidents or other trauma. Three fourths of all head injuries are considered "mild" head injuries. This includes concussions and "bumps on the head." Some persons who have mild head injuries experience problems in their lives due to their injury. The purpose of this study is to examine the effects of mild head injury and possible methods to help persons who are having problems related to their head injury.

I am currently a registered nurse at Bronson Methodist Hospital and I am completing this study as a part of my Master's in Nursing degree. Because you were hospitalized with suspected mild head injury due to trauma during the years of 1988-1990, you have important information to add to our knowledge base. You have been selected for this study because through chart review, you were identified as meeting the criteria for inclusion in the study. Your response will help us understand how your mild head injury has or has not affected you in the past years. Enclosed is a simple questionnaire. In order to learn as much as possible about problems and treatments associated with mild head injuries, it is important that each questionnaire be completed and returned. Please place your completed questionnaire into the envelope enclosed. All postage is provided.

Please understand that your privacy will be protected. Your name is not attached to the information - only numbers. This is so we may check your name off the mailing list when your questionnaire is returned. The data will be reported as group data only - your name will never appear on the results of this study. Do not place your name on the questionnaire.

There is no obligation to participate in this study. If you choose not to participate in this study, please return the incomplete questionnaire in the envelope provided. This will ensure that you are taken off of the mailing list. Your participation/ nonparticipation in this study will have no effect on health or social services that you may need in the future. There is no anticipated risk to you as a result of this study. If you find you have concerns or any problems concerning your health as a result of this study, the researcher (Rebecca Veltman) will refer you to an appropriate person to assist you. Neither Bronson Methodist Hospital, Grand Valley State University, nor the investigator (Rebecca Veltman) accept any responsibility for any problems you may have.

If you return this completed questionnaire, it will be understood that you agree to participate in the study. If you have any questions about the study, or wish to obtain the results of the study, please contact me at the below address.

Thank you for your time and assistance.

Sincerely,

Rebecca E. Veltman, R.N., S.E.N., M.S.N.c
Bronson School of Nursing
252 E. Lovell
Kalamazoo, MI 49002
phone: 341-8913

Appencix C

Permission Letters



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January 19, 1993

Rebecca H. Veltman, R.N., M.S.N.C.
Bronson School of Nursing
252 E. Lovell
Kalamazoo, MI 49007

Dear Ms. Veltman:

Thank you for your fax of this date requesting permission to adapt and reproduce the *Tennessee Self-Concept Scale (TSCS)* for use in your study through the Bronson School of Nursing, entitled "Physiologic Symptoms, Role Function, and Self-Concept 2-4 Years After Mild Traumatic Brain Injury With and Without Cognitive Rehabilitation."

After consideration of your request, Western Psychological Services has determined it will authorize you to adapt the TSCS Test Booklet and to reproduce the adaptation for the sole purpose of conducting the above-referenced study and not for continued or commercial use, upon satisfaction of the following conditions:

(1) You must purchase from WPS a license to reprint the number of adapted TSCS Test Booklets needed to conduct the study;

(2) The license fee for your reproduction of the adapted TSCS will be equal to the cost of purchasing an equivalent number of original TSCS Test Booklets, less 50% Research Discount. See the enclosed brochure for current TSCS prices, and please note that the TSCS Test Booklet (W-182A) is available only in units of ten (10). Also note that shipping and handling charges are not applicable for the purpose of purchasing the license only (i.e. 165 adapted TSCS reprints @ \$25.90/10 = \$440.30 x 50% = \$220.15 total license fee, which equals only \$1.33 per copy);

(3) The license fee must be prepaid. To ensure that your license is processed correctly, please send the license fee to my attention;

(4) Each adapted TSCS reprint must bear the required copyright notice that will be provided to you by WPS; and

Rebecca H. Veltman, R.N., M.S.N.C.
January 19, 1993
Page Two of Two

(5) You agree to provide WPS with one copy of all articles (including dissertations, convention papers, journal submissions, etc.) that use the TSCS data obtained in your research. The articles should be marked to the attention of the WPS Research Coordinator. WPS reserves the right to use any such data; you will of course receive proper acknowledgment if we use your research results.

Upon receipt of your license payment, a license to reproduce the specified number of adapted TSCS copies will be issued and sent to you with the required copyright notice (see condition #4).

Your interest in the TSCS is appreciated, and I look forward to hearing from you again in the near future. If you have any questions, please don't hesitate to call me at 310/478-2061.

Sincerely,

C. Jayne E. Davies
Assistant to the President

CJED:se
Enclosure



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March 17, 1994

Rebecca H. Veltman, RN, MSNc
Bronson School of Nursing
252 E. Lovell
Kalamazoo, MI 49007

Re: Tennessee Self-Concept Scale

Dear Ms. Veltman:


Thank you for your fax of this date, in which you request permission to reproduce copyrighted test material by microfilm.

Due to the public availability of microfilmed copies, Western Psychological Services' policy is not to authorize reproduction of its tests in this manner. While we regret any inconvenience our position may cause, we hope you appreciate our concern with ethical considerations.

Please note that Ms. Melnick, with whom you previously corresponded, served temporarily at this desk during my maternity leave, so if you have any other comments or questions about permissions you may address them to my attention.

Your interest in the TSCS is appreciated, and WPS looks forward to learning the results of your study.

Sincerely,



Susan Dunn Weinberg
Assistant to the President
Rights and Permissions

SDW:se

I, Tom Harald Edna, give Rebecca H. Veltman permission to use and reproduce the instrument used in the study, "Sequelae 2-5 years after mild head trauma".

Signature Tom-Harald Edna Date: March 21, 1994

Tom-Harald Edna, MD

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LIST OF REFERENCES

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