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A DESCRIPTION OF SELF-CONCEPT FOLLOWING TRAUMATIC BRAIN INJURY

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(Order no.)

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Abstract

The purpose of the present study was to describe self-concept following a mild traumatic brain injury (TBI) at the expected endpoint of maximum recovery of function. According to the literature, this endpoint occurs between six and twelve weeks after injury. Additionally, the study was designed to identify any relationships among self-concept, injury severity, and neuropsychological outcome. It was believed that the description and identification of factors associated with self-concept would enhance nursing's knowledge regarding the experience of mild TBI and the nursing diagnosis 'disturbance in self-concept'.

Rosenberg's framework was used to investigate self-concept. Rosenberg describes self-concept as a tripartite structure that is developed, maintained, and enhanced by self-concept motives and principles. Self-concept is operationalized by measuring self-esteem and self-consistency. Additionally, self-consciousness is measured to determine the salience of the self. According to the theory, a healthy self-concept is revealed by high self-esteem, high

self-consistency, and low self-consciousness.

The sample for this descriptive study was comprised of 40 subjects aged 18 to 40 years who were assigned Glasgow Coma Scale scores between 13 and 15 within one hour of admission to the emergency department, met all inclusion criteria, agreed to participate, and completed all instruments. Subjects completed the demographic data sheet, Rosenberg Self-Esteem Scale, Stability of Self Scale, Self-Consciousness Scale, Digit Span Test, Trail Making Test, California Verbal Learning Test, and Paced Auditory Serial Addition Test. They also responded to a question regarding changes following TBI that nurses should know about. Data were analyzed using descriptive and correlational statistics and content analysis.

The study's findings indicated that self-concept was positive and stable at the expected endpoint of maximum recovery of function following mild TBI. Self-concept was weakly to moderately associated with neuropsychological outcome. Subjects who had normal neuropsychological function were more likely to have higher self-concepts than subjects with impaired neuropsychological function. Several themes emerged regarding changes following TBI that nurses should know about including residual symptoms, educational needs, and provider related problems.

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Introduction

The incidence of traumatic brain injury (TBI) in the United States is conservatively estimated at between 180 and 294 cases per 100,000 population or 194,000 to 500,000 cases annually (Fife, 1987; Frankowski, Annegers, & Whitman, 1985; Kalsbeek, McLauren, Harris, & Miller, 1980; Kraus et al., 1984). The conservative nature of this estimate reflects the methods used to arrive at the estimate. That is, only those persons admitted to a hospital were entered into the data pool; therefore, any person experiencing a TBI who did not seek hospital emergency care was not considered in the data analysis.

The number of persons experiencing a TBI that do not seek hospital care is unknown. It has been estimated that the total number of head injuries of all types in the United States is between 1.64 and 2.11 million cases annually (Fife, 1987); however, estimates in excess of eight million cases annually have been projected (Wilder, 1976). Extrapolating from this data, the annual incidence of TBI falls somewhere between the approximately 500,000 persons hospitalized each year to the millions who experience a mild brain injury but do not seek medical care.

Approximately 60% to 82% of all hospital admissions for head trauma are for mild brain injuries (Levin et al., 1987).

Mild TBI is defined as a transient alteration in neurologic function. The common criteria utilized to categorize an injury as mild are Glasgow Coma Scale score of 13 to 15 (Colohan, Dacey, Alves, Rimel, & Jane, 1987), posttraumatic amnesia of less than one hour (Alves & Jane, 1985), and/or loss of consciousness of less than 30 minutes (Boll & Barth, 1983). It is estimated that approximately two-thirds of all traumatic brain injuries are mild (Ruff, Levin, & Marshall, 1987). However, the term mild is not meant to classify the injury as insignificant. Recent studies have clearly demonstrated that significant sequelae can result following a seemingly minor injury (Rimel, Giordani, Barth, Boll, & Jane, 1981).

The sequelae of TBI have been well documented in the literature (Alves, Colohan, O'Leary, Rimel, & Jane, 1986; Benton, 1979; Binder, 1986; Boll & Barth, 1983; Fisher, 1985; Heiden, Small, Caton, Weiss, & Kurze, 1983; Jane et al., 1982; Levin, 1985; Lezak, 1978; Minteer-Convery, 1985; Newcombe, 1982; O'Shaughnessy, Fowler, & Reid, 1984; Rimel et al., 1981; Rimel, Giordani, Barth, & Jane, 1982). There is growing evidence that the biophysical (motor-sensory) ramifications of TBI are relatively less consequential to the total outcome following injury then are the neurobehavioral sequelae (Boll & Barth, 1983; Levin, 1985; McLean, Dikmen, Temkin, Wyler, & Gale, 1984; Newcombe, 1982).

The declining emphasis on physical sequelae following

TBI has been paralleled by an increasing awareness of the behavioral, emotional, and psychological changes that occur. These changes have been recognized in the self reports of TBI patients (Dann, 1984; Gross & Schutz, 1984; Linge, 1980; Roueche & Fordyce, 1983). Some of the changes found following TBI are cognitive deficits, emotional instability, and personality changes (Benton, 1979; Levin, 1985; Newcombe, 1982). Lezak (1978) uses the term characterological alterations to describe the impaired social and psychological functioning of the individual following brain injury. Associated with the changes are alterations in psychosocial functioning. Several investigators report a decline in work, leisure activities, and relationships with friends (Fahy, Irving, & Millac, 1967; Jane et al., 1982; Levin, 1985; Lewin, Marshall, & Roberts, 1979; McLean et al., 1984; Oddy & Humphrey, 1980; Oddy, Humphrey, & Uttley, 1978; Thompson, 1974; Weddell, Oddy, & Jenkins, 1980).

In almost all of these studies, conclusions were reached as a result of ratings on reports from trained examiners, health care providers, or relatives. As pointed out by Tyerman and Humphrey (1984), little effort has been expended in examining psychosocial outcomes from the perspective of the traumatically brain injured individual. While it is recognized that self-evaluation by the traumatically brain injured individual may be limited as a result of the injury, it must be realized that traumatically brain injured

individuals function from their own subjective reality. Therefore, it is imperative that this reality be known.

Statement of the Problem

The intent of this study was to describe the self-concept of individuals who had sustained a mild traumatic brain injury. Outcome following TBI had been related to the severity of the injury (Fisher, 1985; Jane et al., 1982; Levin, 1985; Newcombe, 1982; Rimel et al., 1981; Rimel et al., 1982). In a few studies, self-concept had been demonstrated to decline following severe TBI (Newton & Johnson, 1985; Tyerman & Humphrey, 1984). The effect of mild TBI on self-concept was unknown. Therefore, self-concept was described following traumatic brain injuries of mild severity.

Time since injury had been demonstrated to influence recovery and stabilization of behavior, cognitive ability, emotions, and psychosocial functioning (Bond & Brooks, 1976; Brooks, Campsie, Symington, Beattie, & McKinlay, 1987; Heiden et al., 1983; Lezak, 1987; McKinlay, Brooks, Bond, Martinage, & Marshall, 1981). It was the intent of this study to describe self-concept following the expected return of maximum recovery of function. According to Gronwall and Wrightson (1974) neuropsychological functioning following minor head injury "almost always returns to normal...about thirty-five days after the injury" (p. 7881). Ruff et al.

(1987) stated that within three months following a minor head injury most recovery had taken place, with the major improvements occurring by four to six weeks postinjury. And, following an extensive review of the research on neurobehavioral recovery following head injury, Levin (1985) concluded that the characteristic time course for the resolution of neurobehavioral sequelae of mild injury was two to six weeks. Therefore, self-concept was measured between six weeks and three months following the TBI.

In order to accomplish the intent of this study, the following research questions were addressed:

1. What is the self-concept of persons who have sustained a mild TBI at the expected endpoint of maximum recovery of function?
2. How is self-concept following a mild TBI related to injury severity as determined by the admission Glasgow Coma Scale score?
3. How is self-concept following a mild TBI related to neuropsychological outcome at the expected endpoint of maximum recovery of function?

Theoretical Framework

Self-concept, as described by Rosenberg (1979), is the framework upon which this study was designed. Rosenberg views human beings from a phenomenological, social interactionist perspective. He describes the self as an

"object of perception and reflection" (1979, p. 8) defining self-concept as "the totality of the individual's thoughts and feelings having reference to himself as an object" (1979, p. 7). The self as an object is represented by the structure of the self-concept; the thoughts and feelings that give rise to the self-concept are expressed as the self-concept motives and principles.

Self-Concept Structure

The structure of the self-concept is tripartite. The three distinct areas of the self-concept structure are the extant self-concept, the desired self-concept, and the presenting self-concept.

Extant self-concept. The extant self-concept represents the individual's view of the self. As such, it reflects what one sees when looking at the self. The extant self-concept is composed of four areas. The areas are content--the parts, consisting of social identity elements, dispositions, and physical characteristics; structure--the relationship among the components of the content; dimensions-the self-attitudes; and ego-extensions--the boundaries of the self. The social identity elements of the extant self-concept have been characterized as describing what one "surely" is, while dispositions reflect most closely what the individual "truly" is.

Desired self-concept. The aspirations of the individual are reflected in the desired self-concept. The desired self-

concept is composed of three images of the self. They are labeled the idealized image, the committed image, and the moral image. The idealized image represents that which one would like to be, given no limits or restrictions on imagining. The committed image is a more realistic vision of what one can or could be, and the moral image provides a set of standards for what one must, should, or ought to be. Rosenberg (1979) attributes motivational and evaluative functions to the desired self-concept. Motivation is found in the desire to attain the images while evaluations are derived from comparison to the desired self-concept images.

Presenting self-concept. The presenting self-concept is the self-concept that is presented to others in interaction. The presenting self is described as comfortable, congenial, and non-conflictual (Rosenberg, 1979). In presenting a specific image of the self, the individual is involved in impression management. As such, one acts to achieve specific ends, goals, or values; to receive feedback about the perceived self; and to demonstrate internalization of social expectations in specific social roles. The presenting self-concept is fluid and dynamic providing a mechanism for situation bound variability in the presented self.

Self-Concept Motives and Principles

The tripartite structure of the self-concept is developed, maintained, and enhanced through the self-concept motives and principles. Motives are the driving forces that

act to maintain and enhance the self-concept. The principles are advanced to explain the influence of social structural forces on the development of the self-concept over time and in situational contexts.

Self-concept motives. To a large extent the explanation for why an individual perceives, interprets, and acts on information in a specific manner can be found in the self-concept motives. Two self-concept motives are described as significantly influencing behavior. They are the self-esteem motive and the self-consistency motive. In general, these two motives act in consort to support the self-concept. It is through the measurement of these two motives that self-concept is operationalized in Rosenberg's framework.

The self-esteem motive acts to enhance the self-concept by seeking out situations or offering explanations for behavior that highlight the positive or good aspect of the individual. The self-esteem motive has been universally recognized as a powerful force in determining behavior (Rosenberg, 1979).

The self-consistency motive acts in accordance with the self-concept in an attempt to maintain an intact self-concept in the face of potentially challenging or contradictory evidence. The self-consistency motive provides the individual with a picture of what he is like so that incoming information may be processed and acted upon. As such, it provides the individual with a fundamental frame of reference

for all behavior.

Self-concept principles. Four principles are identified as significantly and diversely influencing the development of self-concept. The principles are reflected appraisals, social comparisons, self-attribution, and psychological centrality. These principles may influence the self-concept individually or in combination. In applying the principles to the understanding of the self-concept, Rosenberg incorporated several social psychological theories into his explanation of self-concept.

The first principle, that of reflected appraisals, is predominantly derived from symbolic interactionist theory. Reflected appraisals represent the perceived attitudes of others toward the self. Over time the attitudes of others are incorporated into the attitudes about the self until eventually the self sees the self as seen by others. Three types of reflected appraisals are identified--direct reflections, the mental images of others' views of the self; perceived selves, the perception of others' attitudes toward the self; and the generalized other, the perception of the attitudes of the community toward the self.

The principle of social comparisons is an outgrowth of social evaluation theory. This principle holds that individuals compare themselves with established standards; this comparison influences self-concept. The comparison standards may be derived from a reference group, one's past

performance, the image of the desired self, or other individually important sources. Comparisons may be individually or normatively referenced.

Self-attribution, derived from attribution theory, refers to the process that individuals utilize to draw conclusions about their behavior. It is the mechanism utilized to explain behavior based upon the overt outcome of the behavior. Self-attribution provides a means for individuals to draw conclusions about themselves based upon the outcomes of their behavioral efforts. If the outcome is good, it is predicted that the related self-concept will be positive.

The last principle, psychological centrality, recognizes that the parts of the self-concept are hierarchically arranged. The arrangement of the parts of the self-concept is dependent to a large extent on the psychological importance accorded to each individual self-concept part. Thus, not all of one's social identity elements, dispositions, physical characteristics, attitudes, or desires are of equal significance. Those parts that are more highly valued or that one more easily maintains are more central to the self-concept than those parts that are viewed peripherally. In order to explain or predict the impact of a behavior on self-concept, one must know the importance attached to that self-concept component by the individual.

Application of the Framework

Rosenberg's description of self-concept is comprehensive. He describes the self-concept as a three component structure (see Figure 1) that is influenced by the processes of self-motives and principles of differential social-psychological forces (see Figure 2). This description of self-concept provides a powerful position from which to examine the self-concept either in its entirety or in part. It must be remembered that each part of each component, each component of the whole, and the whole itself are bound by the influence of self-concept motives and principles. It is the action of the motives and principles, singly and in combination, on the structure of the self-concept that provides the explanation for the gradual development of the self-concept, as well as for change, or lack of change, in the self-concept over time. Through measurement of the self-concept motives a description of global or specific self-concept, at any point in time, is obtained.

The structure and process of self-concept as described by Rosenberg provided a framework to examine the self-concept of the traumatically brain injured individual. Reports of personality disturbances were common in the brain injury outcome literature. Some of the disturbances cited were emotional instability, lowered frustration tolerance, depression, withdrawal, disinhibition, and euphoria (Benton, 1979). Lezak (1978) described the brain injured individual

Figure 1: The structure of self-concept as proposed by Rosenberg

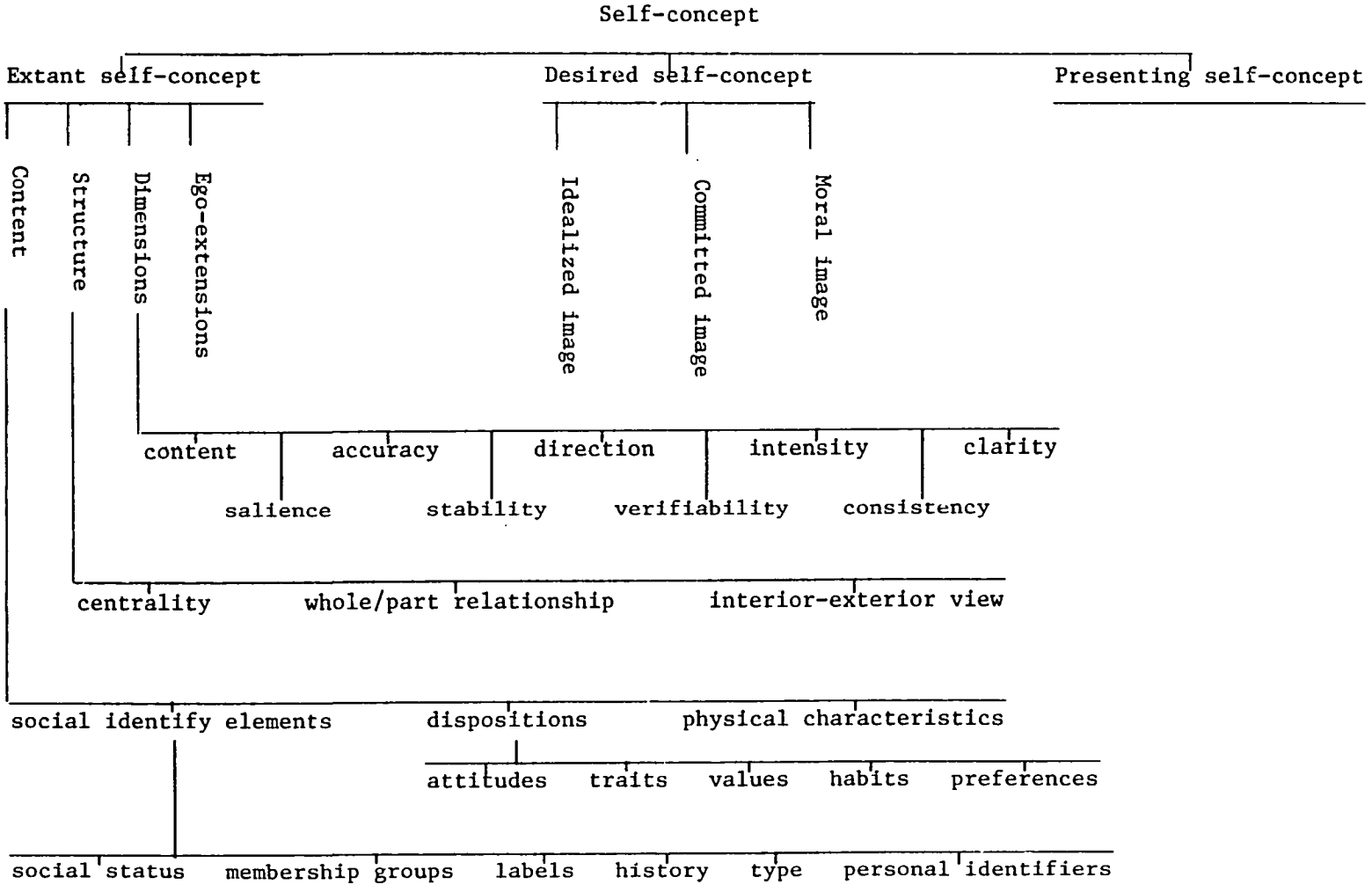
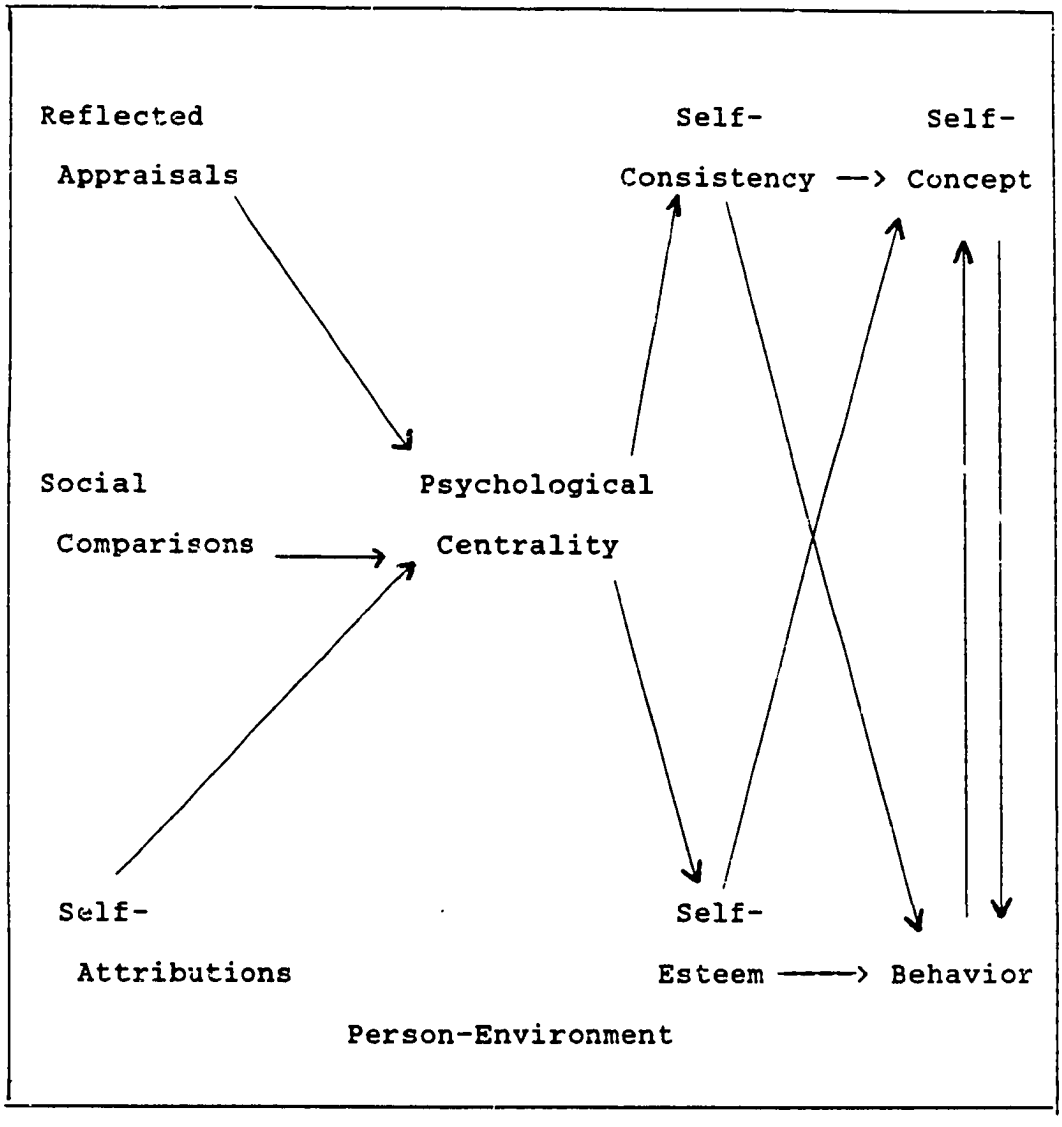


Figure 2: Model of the process of self-concept motives and principles on self-concept as proposed by Rosenberg



as often evincing impaired social perceptiveness, impaired self-regulatory behavior, stimulus bound behavior, and an inability to profit from experience. Altered coping patterns and a sense of loss of self were also reported (Dann, 1984; Gross & Schutz, 1984; Linge, 1980).

The traumatically brain injured individual is known to experience social morbidity as a result of the injury. Social morbidity is seen in the inability to maintain role expectations in performing central social roles (Alves & Jane, 1985), reduction in work ability (Rimel, et al., 1981; Rimel, et al., 1982), reduction in leisure activities and social contacts (Oddy et al., 1978), and poor social adjustment (Oddy & Humphrey, 1980).

Utilizing Rosenberg's framework, it was hypothesized that the personality disturbances and social morbidity that follow TBI would lead to low self-esteem, low self-consistency, and thereby, low self-concept. In fact, Newton and Johnson (1985) reported lowered self-esteem in the severely brain injured individual and Tyerman and Humphrey (1984) found lowered present self-concept in severely brain injured individuals. In addition, Rosenberg (1979) believes that self-concept is not salient in the healthy individual. Disturbance in self-concept is a deviation from health as evidenced by its inclusion on the accepted list of nursing diagnoses. It was, therefore, further hypothesized that the decline in self-concept that accompanied TBI would be

associated with higher self-consciousness.

Definition of Terms

The following terms are defined as they were utilized in this study.

Self-Concept

The totality of the individual's thoughts and feelings having reference to the self as a person (Rosenberg, 1979, p. 7). Self-concept was measured as the scores obtained on the Rosenberg Self-Esteem Scale, the Stability of Self Scale (New York State), and the Self-Consciousness Scale.

Traumatic Brain Injury

An injury that resulted in trauma to the brain that may or may not be visible. Closed brain injury is produced when mechanical forces, referred to as stresses, result in the distortion or deformation of brain vasculature or neural tissue. The most common type of stress is the acceleration-deceleration force. With this type of injury, the head moves rapidly either from or to a resting position.

The effects of the mechanical forces on the brain are believed to be rotational and centripetal (Gennarelli, 1987). Centripetal forces cause the disruption of superficial structures (i.e., cortex and lower brainstem) to a greater extent than deeper subcortical and upper brainstem structures. The neural structure most susceptible to strain (distortion) is the axon. The extent of axonal injury may

range from temporary loss of membrane potential resulting in the temporary inability of the axon to conduct an action potential (impulse) to axonal transection with irreversible loss of neuronal function. This more severe form of axonal disruption is referred to as diffuse axonal injury.

Other mechanisms of closed traumatic brain injury are stresses that result in focal cortical or subcortical contusions and/or hematoma formation. In addition, secondary effects of the injury from hypoxic-ischemic events may deleteriously influence outcome (Alexander, 1985). As a separate class of traumatic brain injury, open injuries are the result of penetrating missiles, for example bullets, knives, and bone fragments or open cranial fractures (Friedman, 1983). As with the closed injuries, secondary hypoxic-ischemic events may adversely affect outcome following open head injuries.

The clinical manifestations of TBI encompass neurological as well as neuropsychological deficits. The extent and nature of the symptomatology depends upon a number of factors, most importantly the nature, location, and severity of the brain injury. The sequelae most commonly associated with mild TBI are described next.

Mild traumatic brain injury. According to Gennarelli (1987), mild TBI, in the absence of abnormalities on computerized tomography or skull radiography, results in cerebral concussion. He defines concussion as "an immediate

and transient disturbance of neurologic function due to mechanical forces" (p. 23). The disturbances that follow concussive injuries may include momentary focal alterations in cortical function (e.g., visual changes, limb paresis, limb paresthesia, auditory changes), transient confusion and disorientation, confusion accompanied by amnesia, and loss of consciousness. With the exception of memory deficits, these disturbances are customarily considered to be temporary and reversible. Typically, an amnesia for a short time period surrounding the injury may persist.

Occasionally an individual may report persistent symptoms following a mild TBI. The most commonly reported symptoms are persistent headache, dizziness, memory problems, weakness, insomnia, anxiety, and difficulty in performing activities of daily living (Alves et al., 1987; Rimel et al., 1981; Rutherford, 1977). This constellation of symptoms has been termed Posttraumatic Syndrome (formerly Postconcussive Syndrome). While the pathophysiologic basis for this constellation of symptoms is not well understood, most investigators and clinicians agree that mild TBI may cause functional deficits that interfere with returning to preinjury levels of performance (Alves et al., 1987; Alves & Jane, 1985; Binder, 1986; Gronwall & Wrightson, 1974; Rimel et al., 1981).

Operationalization. The classification of mild TBI was based on the Glasgow Coma Scale (GCS) score initially

recorded by a registered nurse, physician, or their designee within one hour of entering the health care system. GCS scores between 13 and 15 indicate mild traumatic brain injury. Becker et al. (1977) consider the GCS an acceptable standardized instrument for grading the severity of brain injury.

Neuropsychological Outcome

Neuropsychological outcome was the effect of traumatic brain injury on behavior. According to Lezak (1983), behavior is conceptualized as intellect, emotionality, and control.

Intellect. Intellectual behavior incorporates the functions of information reception, memory and learning, thinking, and information expression. The intellectual functions have received the most attention in the discipline of neuropsychology; Lezak (1983) attributes this to the prominence of intellectual dysfunction in the symptomatology of brain injury, the availability of measurement tests, and the limitations in assessing emotional and control behaviors in the clinical examination.

Receptive functions include all processes through which information enters the central processing system of the brain. Examples of receptive functions are sensation and perception. Perception is further divided into the activities of awareness, recognition, discrimination, patterning, and orientation. Disorders of the perceptual

system are manifested by deficits in attention, concentration, and tracking.

Memory and learning are considered the most central and characteristically human behaviors (Lezak, 1983). Lezak (1983) describes three types of memory: registration, short-term memory, and long-term memory. Registration is the selection and recording process through which perceptions enter the memory store; registration is dependent upon the level of consciousness and alertness of the individual.

Short-term memory involves the processes of immediate memory, where information is retrievable from approximately 30 seconds to several minutes after registration, and rehearsal. Rehearsal is the mental process of repeating information to prolong the duration of the information in memory. Through rehearsal information can be stored in short-term memory for hours. In addition, rehearsal improves the transfer of information into long-term memory. Injuries that interfere with short-term memory are characterized by a reduced memory span.

Long-term memory involves the process of consolidation--the more or less permanent storage of information. Long-term memory is commonly divided into recent memory--memory for events from hours to months following their consolidation, and remote memory--memory for events that occurred years previously. Disorders of long-term memory are manifested by the amnesias. Anterograde amnesia represents an inability to

incorporate new memories (learn), while retrograde amnesia is considered a retrieval disorder (remembering).

The third intellectual function, thinking, is defined as "any mental function that relates two or more bits of information..." (Lezak, 1983, p. 30). Thinking involves processes such as computation, concept formation, and planning. As with all intellectual functions, thinking impairments are linked to the nature (verbal vs. visuospatial) and the extent of the injury.

Information expression, or observed behavior, is the basis for inferring all intellectual activity (Lezak, 1983). The expressive functions are speaking, writing and drawing, manipulating, gesturing, and moving. Disturbances of expressive behavior are the apraxias, aphasias, agraphias, and alexias.

Emotionality. Emotional behavior incorporates the influence of personality variables and emotions on behavior. As previously noted, brain injury commonly results in an alteration in personality and emotions such that the emotional aspect of behavior differs significantly from its premorbid characteristic pattern. For most individuals the changes are adverse; however, reports of improvements in emotional behavior following TBI are present in the literature (Fahy et al., 1967; Weddell et al., 1980). Emotional behavior assessment is generally not amenable to standardized paper and pencil tests. Without the advantage

of long-term, frequent contact with the brain injured individual, investigators must rely on structured interviews, surveys, and others' reports of observed behavior to determine the effect of brain injury on emotional behavior.

Control. Control or executive behaviors consist of "those capabilities that enable a person to engage in independent, purposive, self-serving behavior successfully" (Lezak, 1983, p. 38). Defects in executive functions range from the obvious, for example, the inability to perform the usual activities of daily living, to the more discrete deficits like lack of motivation, inability to initiate, and inability to plan.

Operationalization. In this study, neuropsychological outcome was measured as the scores obtained on four tests of intellectual behavior. The tests were the Auditory Digit Span subtest of the Wechsler Adult Intelligence Scale-Revised (WAIS-R), the Trail Making Test, the California Verbal Learning Test, and the Paced Auditory Serial Addition Test (PASAT). Auditory Digit Span measured auditory attention and registration (forward condition) and memory (backward condition). The Trail Making Test measured attention, visual conceptual and visuomotor tracking, and motor speed. As such it involved the intellectual functions of reception, thinking, and expression. The California Verbal Learning Test measured short-term memory and learning. Lastly, the PASAT measured attention, mental tracking, and speed of

information processing--indices of the reception and thinking functions of intellectual behavior.

These four tests of neuropsychological function were selected to provide a battery of tests that could be administered in a reasonable time period and assess all of the functions of intellectual behavior. These particular tests measured the functions recommended by Ruff et al. (1987) for neurobehavioral assessment of the mildly head injured individual. In addition, these tests, with the exception of the California Verbal Learning Test, were recommended by Lezak (1983) for their ability to identity deficits in the brain injured individual. The California Verbal Learning Test had been published recently and was not reviewed by Lezak.

Expected Endpoint of Maximum Recovery of Function

The expected endpoint of maximum recovery of function was the time interval following the TBI at which the individual could have been expected to have recovered maximum function. The time to recovery of maximum function depended primarily upon the severity of the injury, although individual differences and postinjury complications do result in variability in recovery curves. For the purposes of this study, the expected endpoint of maximum recovery of function was six weeks following the injury (Gronwall & Wrightson, 1974; Levin, 1985; Ruff et al., 1987).

Rationale

Martin Spivak, past president and cofounder of the National Head Injury Foundation (NHIF), in addressing the Boston Neuropsychological Foundation at its meeting in November, 1985 stated that head injury rehabilitation is the big business of the 1980's. The improvement in neurological management of the TBI patient has resulted in an increase in survival following TBI. Improved survival has been attributed to improved medical management (Dikmen, Reitan, & Temkin, 1983; McKinlay et al., 1980), improved resuscitative treatment and treatment of complications (Lewin et al., 1979), regionally optimal triage planning (Marshall, 1982), computerized tomography (Minteer-Convery, 1985), and advances in the emergency evaluation of the TBI patient (Levin, 1985).

The increased numbers of persons surviving the traumatic brain insult has created a crisis in the rehabilitation field (Jennett, 1976). Not only are rehabilitation services viewed as inadequate, but also little is known about the process of rehabilitation of the traumatically brain injured individual (Medical Research Coordinating Council Group, 1982).

Studies in orthopedic rehabilitation (Litman, 1962), chronic pain (Armentrout, 1979), and breast self-examination (Hallal, 1982) have demonstrated the effect of self-concept on patient behavior. Self-concept has been demonstrated to decline as a result of a disabling injury or condition (Armentrout, 1979; Brinkman & Hoskins, 1979; Green, Pratt, &

Grigsby, 1984; Litman, 1962). The decline in self-concept that accompanies disability is amenable to improvement with rehabilitation. It stands to reason that the rehabilitative effort that improved self-concept in the orthopedically disabled patient (Litman, 1962), the chronic head and back pain patient (Armentrout, 1979), the long-term spinal cord injury patient (Green et al., 1984), and the post-cerebrovascular accident hemiplegic patient (Brinkman & Hoskins, 1979) might also enhance self-concept in the traumatically brain injured individual. The effect of mild TBI on self-concept is virtually unknown. Available studies demonstrate a profound decline in self-concept in the severely brain injured individual (Tyerman & Humphrey, 1984).

Boll and Barth (1983) advance the position that the extensive impact of head injury on multiple aspects of human functioning requires adequate evaluation. One such area for evaluation is self-concept. Self-concept represents how one thinks about the self. It is important to know if the traumatically brain injured individual experiences a decline, a redefinition, or no change in self-concept as a consequence of the injury. This knowledge will provide the foundation for the identification and implementation of appropriate interventions, at appropriate times, to support the individual's self-concept.

The lack of studies that investigated self-concept in the individual with a mild TBI, the important role of self-

concept in disabling injuries or conditions, the relationship of self-concept to rehabilitation, and the need for adequate rehabilitation services for the traumatically brain injured individual supported the need to fully examine the impact of mild TBI on self-concept. This process must start with a description of the self-concept of the individual who had sustained a mild TBI. The purpose of the present study was to provide this description.

Significance for Nursing

Knowledge of an individual's self-concept is essential for the practicing nurse. Kim (1983) defines "essentialistic concepts ...[as] those phenomena present in the client as essential characteristics and processes of human nature that are important to nursing and to human health in general" (p. 43). She believes that attention to continued clarification of essentialistic concepts is critical to the refinement of nursing knowledge. Self-concept is identified as one of the essentialistic concepts.

The acceptance of self-concept as an area of concern for nurses is evident in the inclusion of this concept in the original and all subsequent lists of accepted nursing diagnoses. Since its original inclusion, much work has gone into the identification of the etiology and defining characteristics of the diagnosis 'disturbance in self-concept' (Gibb, Kraynick, & Biebel, 1987; Metzger & Hiltunen,

1987; Morris, 1985; Norris & Kunes-Connell, 1987). However, the identification of critical indicators for the diagnosis has only been accomplished for one diagnostic subcategory--disturbance in body image. Critical indicators are not available for the disturbance in self-esteem or personal identity subcategories, and the universe of subcategory identification within the diagnostic label is incomplete. Furthermore, efforts at identifying defining characteristics are directed at the nurse's perception of critical cues. Reliable and valid instruments to measure components of self-concept have not been utilized to any significant extent.

The present investigation added to the beginning body of knowledge on this diagnostic category. This was accomplished through the identification of (a) the utility of Rosenberg's conceptualization of self-concept for the discipline of nursing; (b) the etiologies for disturbances in self-concept; and (c) the defining characteristics as objective measures, obtained through the administration of reliable and valid self-report measures.

The identification of diagnostic data associated with the label, disturbance in self-concept, will benefit nursing practice in several ways. First, Aydelotte and Peterson (1987) point out the tremendous need to enhance the reliability and validity of individual nursing diagnoses. The present study added to the accumulated knowledge regarding this diagnosis. Second, nurses in a variety of

health settings care for persons who have sustained a mild TBI. Accepted present practice is to educate the patient and family about the biophysical sequelae of TBI, specifically the signs and symptoms of increased intracranial pressure. It is important that nurses expand this educational content to include the psychosocial sequelae, especially as related to self-concept. As a nursing diagnosis, self-concept disturbances are deviations from health that nurses are expected to identify and treat. Finally, the study's findings provided information about the nature of the relationships that exist between self-concept and neuropsychological function following mild TBI. Since health is associated with a positive self-concept, the identification of the relationships between these variables and self-concept was important. With this information at hand, the nurse can anticipate the affects of deviations in these parameters and intervene to prevent or lessen their impact on self-concept.

Scope and Limitations

The focus of this study was the description of self-concept at the expected endpoint of maximum recovery of function following a mild TBI. The purpose for examining self-concept across the range of mild injury severity levels and neuropsychological function was to determine if any relationships were evident among self-concept, severity of

the mild injury, and neuropsychological outcome following the injury. It was not the intent of this study to demonstrate any causal relationships among the variables of self-concept, severity, neuropsychological outcome, and expected endpoint of maximum recovery of function. Studies were needed that described self-concept prior to the commencement of causal investigation. Neither was it the intention of this study to determine the relationship, if any, between self-concept and rehabilitation of the traumatically brain injured individual. Again, although this type of investigation is necessary and important, one must begin by describing the self-concept of the individual who had sustained a mild TBI.

Summary

The improved survival of the traumatically brain injured individual had resulted in a shift in emphasis away from the biophysical sequelae of TBI and toward neurobehavioral outcomes. These outcomes were believed to exert a major impact on social morbidity following TBI. Reports of families, health care providers, and trained observers clearly demonstrated declines in psychosocial, emotional, and cognitive functioning as a consequence of TBI. It was thought that these functional declines would disrupt the traumatically brain injured individual's self-concept.

The present study was designed to determine the effect of a traumatic brain injury on the injured individual's self-

concept. Rosenberg's formulation of self-concept, as a tripartite structure influenced by self-preservation and self-enhancement motives and social-psychological principles, provided the theoretical framework upon which the study examined self-concept in the brain injured individual. Specifically, measures reflective of self-esteem, self-consistency, and self-consciousness were obtained. Using Rosenberg's framework, self-concept was defined as "the totality of the individual's thoughts and feelings having reference to himself as an object" (1979, p. 7). These thoughts and feelings were operationalized by the self-esteem and self-consistency motives. In addition, self-concept was not salient in the healthy individual. Measures of self-consciousness provided indicators of self-concept salience.

It was believed that knowledge of the effect of mild TBI on self-concept would provide the foundation for the identification and testing of interventions to either support the self-concept or promote the redefinition of the self-concept in the rehabilitative process. Furthermore, the present study added valuable insights into the etiology and defining characteristics of the nursing diagnosis--disturbance in self-concept.

The remainder of this report is laid out as follows. In Chapter 2 a review of the literature is presented. This review summarizes the studies investigating alterations in self-concept following illness or injury and the studies

examining neuropsychological outcomes following TBI. Special emphasis is given those studies that investigate self-concept following TBI. Chapter 3 involves a report of the design and methods of the current study. In this chapter, the methods for sampling, protecting human subjects, and conducting the study, as well as instrumentation and data analysis procedures are reported. In Chapter 4 the analysis of the data is presented. And finally, the conclusions of the study, implications of the findings for the discipline of nursing, and recommendations for further study are discussed in Chapter 5.

C H A P T E R I I

Review of the Literature

In this chapter a review of the literature is presented. Studies describing the alterations in self-concept that occur following injury or illness are discussed. This discussion includes those studies that have examined self-concept in the traumatically brain injured individual. Additionally, the investigations describing outcomes following traumatic brain injury are presented. This presentation encompasses a review of outcomes over time as well as across injury severity levels.

Alteration in Self-Concept

Descriptions of changes in self-concept following a variety of disabling conditions are found in the literature. However, not all injuries or illnesses result in a decline in self-concept. In this section of this chapter, the studies which reported a decline in self-concept are discussed including the limited number of studies investigating self-concept following TBI. In addition, studies that failed to find self-concept changes associated with specific illnesses or injuries are reviewed.

Studies of Changes in Self-Concept

Self-concept is frequently reported to decline following a disabling condition. Litman (1962) investigated the

influence of self-concept on the rehabilitation of 100 orthopedically disabled patients aged 15 years or older who underwent rehabilitation in two midwestern medical facilities over a period of 15 months. Subjects were administered the Disability Self-Conception Scale, a modified form of the Jansen-Hill family integration scale, and a Social Participation and Leisure-Time Activities scale. Relatives were asked to complete a mailed questionnaire addressing questions about the preillness personality of the individual. The Disability Self-Conception Scale measured the subject's evaluation of the attitudes of others toward the self as well as sense of personal worth and adequacy.

Litman (1962) reported a strong positive relationship between self-conception and response to rehabilitation. He recommended that attention be directed to providing an atmosphere conducive to a positive self-conception to facilitate rehabilitation and that patients be counselled regarding the importance of a positive self-concept in rehabilitation. No relationship was found between preillness personality as reported by relatives and rehabilitation response.

The influence of rehabilitation on self-concept was investigated in seven poststroke hemiplegic patients by Brinkman and Hoskins (1979). In this study levels of physical conditioning and self-concept were determined before, during, and after a 12 week program designed to

improve physical condition. The Tennessee Self Concept Scale (TSCS) and Social Vocabulary Index (SVI) were both utilized as measures of self-concept.

Prior to the onset of the conditioning program, the subjects were found to have significantly lower self-concepts than the normative group on 4 of the 14 TSCS subscales (Total P, Identity, Physical Self, and Personal Self) and all five subscales of the SVI. The self-concept improved significantly during and at the end of the conditioning program as measured by the Identity, Physical Self, Personal Self, and Social Self TSCS subscales and the SVI self-concept subscale. A Spearman $\underline{r}$ of 0.78, $\underline{p} \leq .10$ between improvement in predicted maximum oxygen uptake (an indicator of physical fitness) and improvement in the SVI self-concept subscale was the only significant correlation reported (Brinkman & Hoskins, 1979). The investigators concluded that the noted improvements in self-concept reflected the subject's revaluation of self-concept as a result of improved physical condition. No recommendations were offered.

Armentrout (1979) studied the relationship of chronic pain to self-concept in a framework designed to elucidate if chronic pain and its potential impairment in physical functioning would be reflected in lower self-concept scores. A total of 60 subjects divided into three equal groups of medical patients without chronic pain, chronic back pain patients, and chronic head pain patients were administered

the TSCS. Analysis of variance and Duncan's New Multiple Range Test were performed to ascertain if differences existed among the self-concept scores of the three groups of subjects.

The investigator found that medical patients possessed a higher self-concept ($p \leq .05$) than either the low back pain or the head pain patients on all measures except self criticism and social self (Armentrout, 1979). He concluded that chronic pain (pain of greater than one year duration) had a significant negative impact on self-concept. This effect was most likely the result of a change in life patterns and abilities and negative stereotypes held by health care providers and the general public toward the chronic pain patient.

The effect of long-term spinal cord injury on self-concept was investigated by Green, Pratt, and Grigsby (1984). A volunteer sample of 71 subjects with a four year minimum history of spinal cord injury was administered the TSCS and an 18-item questionnaire on selected variables. The investigators found statistically significantly higher mean scores on the Personal Self ($t = 2.88$, $p \leq .05$), Social Self ($t = 3.31$, $p \leq .05$), and Moral-Ethical Self ($t = 2.88$, $p \leq .05$) subscales of the TSCS. The Physical Self subscale of the TSCS was found to be lower for spinal cord injury patients ($t = -6.05$, $p \leq .05$).

Green et al. (1984) concluded that long-term spinal cord

injury patients hold positive self-concepts; the positive self-concepts reflect adjustment to a disabling condition with redefinition of the preinjury self-concept. Health care providers need to be cognizant of this process of self-concept redefinition and the variables that support positive redefinition. In this study those variables were younger age, younger age at injury, higher levels of education, perceived independence, providing one's own transportation, and living with others. Environments should be constructed that maximize the effects of these variables and providers should support the self-concept redefinition process.

Studies that Failed to Demonstrate Self-Concept Changes

Not all physical disabilities result in a decline in self-concept. In a study of 59 female adolescents with treatable idiopathic scoliosis, Anderson (1982) found no difference in self-concept between the study subjects and a sample of peers. Using the Attitude Toward Disability Test (ATDT) and the Total Positive score on the TSCS, she demonstrated a positive correlation between self-concept and self-reported coping style. This relationship led her to conclude that the study subjects realistically viewed their disability without allowing their perception of disability to hinder normal activities.

In discussing the implications of the findings, Anderson (1982) suggested that coping strategies that isolate the

negative aspects of disabilities might be acceptable methods of dealing with marginal disabilities. In addition, health care providers should not automatically assume that self-concept becomes unstable or deteriorates with all physical disabilities.

A multicenter longitudinal and cross-sectional study on the impact of mastectomy for breast cancer on self-concept also demonstrated no appreciable decline in self-concept. Penman et al. (1986) studied 1,715 women to determine the psychosocial morbidity and the predictors of psychosocial morbidity following mastectomy for Stage I or II breast cancer. The findings with respect to self-concept are summarized.

The Rosenberg Self-Esteem Scale (RSES), Body Image Scale, and Feminine Self-Image and Intimacy Scales were utilized as outcome measures of self-concept. In analyzing the data, Penman et al. (1986) found no significant difference in self-esteem scores across the four study groups (mastectomy, mastectomy plus adjuvant therapy, cholecystectomy, and breast biopsy) or control group (no surgery). With time a decline in self-esteem was noted in the mastectomy plus adjuvant therapy group. Predictors of low self-esteem, explaining 13% of the total variance in the regression equation, were perceived lack of support, locus of control, and magnitude of life change events in the preceding three months. The mastectomy plus adjuvant therapy group

demonstrated body image dissatisfaction (B = .09, $p \leq .01$) and feminine self-image concerns (B = .13, $p \leq .001$). No differences in intimacy concerns existed across the study groups.

Penman et al. (1986) concluded that self-concept changes following mastectomy are small and confined to those women receiving adjuvant radiation therapy or chemotherapy. Health care providers should no longer assume that mastectomy for breast cancer is accompanied by a decline in a woman's self-concept.

Self-Concept Changes in TBI

The only available study designed to investigate self-concept in a sample of head injury patients was reported by Tyerman and Humphrey in 1984. They examined the self-concepts of 25 severely head injured patients between the ages of 18 and 25 years approximately seven months (range 2 to 15 months) postinjury utilizing the Leeds Scales of Anxiety and Depression, the Litman Physical Disability Self-Conception Scale, the 20-item Semantic Differential Scale (designed to measure self-concept), and a 30-item Neuropsychological Problem Schedule. In responding to the Semantic Differential, the subjects rated Past Self, Present Self, Future Self, a Typical Person, and a Typical Head Injured Person.

While statistically significant differences ($p \leq .01$) were found for 17 of the 20 constructs comparing present self

with past self and 18 of the 20 constructs comparing present self with future self, no statistically significant differences were found between past self and future self. In comparing the present self with a typical head injured person statistically significant differences ($p \leq .05$) were found for 5 of the 20 constructs plus overall self-concept; however, only one construct--attractiveness--differentiated the present self and a typical person (Tyerman & Humphrey, 1984).

As a result of these findings, Tyerman and Humphrey (1984) concluded that while the severely head injured individual has experienced a general decline in self-concept, this person anticipates returning to the preinjury self within one year. In addition, head injured patients perceived themselves as similar to a typical person and better off than the typically head injured person. It was recognized that, while this study demonstrated the changed self-concept experienced following severe head injury, the potentially unrealistic expectation of the head injured person to return to normal may hamper the rehabilitative process. Therefore, confrontation and counselling regarding the realistic outcome of head injury is needed. In addition, this study demonstrated the usefulness and usability of self reports of head injured individuals in investigating the personality changes experienced following head injury.

In a study of social adjustment following head injury,

Newton and Johnson (1985) found lower self-esteem in a group of 11 severely head injured subjects as compared to 32 normal control subjects ($Q = 19.07$, $p < .01$). The RSES was used to measure self-esteem. In addition to lower self-esteem, when compared with normal control subjects the head injured subjects demonstrated poorer social performance, as measured by two independent raters scoring a videotaped conversation, poorer social adjustment, as measured by the Katz Adjustment Scale, and higher social anxiety, as measured by the Questionnaire of Social and Evaluative Anxiety.

Newton and Johnson (1985) concluded that severely head injured individuals may have poor social adjustment as a consequence of social interaction difficulties. Those professionals involved in rehabilitation should utilize strategies to enhance the social interaction skills of the severely brain injured individual. With improved social interaction abilities, social anxiety would decline and self-esteem and social adjustment would improve.

Outcome Following Head Injury

In this section of this chapter, studies that examine neuropsychological outcome within and across TBI severity levels are reviewed. There is an extensive literature that describes the neurophysical and the neuropsychological outcomes following head injury. The effect of head injury on behavior, cognition, psychosocial functioning, and emotions

has been described. However, as identified by Levin (1985) as well as others, methodological deficiencies are evident in most investigations of outcome following TBI. These deficiencies include lack of information on preinjury level of function, no or inappropriate control groups, nonuniform determination of injury severity, lack of longitudinal studies, and variations in neuropsychological measurement techniques (Levin, 1985). These deficiencies require that studies be read carefully for possible methodological flaws and that caution be used in generalizing findings beyond the study sample.

Outcome Following Severe TBI

The majority of studies on outcome following TBI investigate the effect of severe TBI on neuropsychological outcome. Fahy, Irving, and Millac (1967) conducted a six year follow up study of 28 males and 4 females over the age of 15 years who had sustained a severe head injury as defined by the need for neurosurgical operation and the occurrence of posttraumatic amnesia (PTA) of greater than three days duration. Standard psychiatric interviews in the presence of a suitable informant, electroencephalogram, skull x-rays, and neurologic examinations were utilized to collect data.

Six patients died before follow up. In the remaining 26 patients, Fahy et al. (1967) found evidence of deluded or demented mental function in 50% of the subjects and impaired earning power or inability to work in 50% of the subjects.

The investigators noted that objective impairments of social adjustment (operationalized as gainful employment) were essentially unrelated to clinical findings in that the remaining 50% of subjects had unimpaired earning power despite severe injuries.

Two other interesting findings are evident in this study. The investigators found that while both neurological and psychiatric sequelae were significantly related to each other ($\underline{r}$ = 0.56, $\underline{p} \leq .01$) and to the length of PTA following injury, only psychiatric disability remained significantly related to duration of PTA when partial correlations were calculated ($\underline{r}$ = 0.54, $\underline{p} \leq .05$). This finding may represent the memory impairments common to both syndromes. However, significant intercorrelation of psychiatric and neurological sequelae indicated that no single measure of function would be sufficient as a criterion of recovery.

Additionally, the investigators reported that the reliability of the informants, despite an initial skepticism, proved satisfactory. Discrepancies were found between patient and relative accounts. Most of these discrepancies were the result of a lack of spontaneous complaints in demented patients who were believed to lack insight and an inability of the patient to recognize personality changes.

Lewin, Marshall, and Roberts (1979) investigated long-term outcome following severe head injury. To qualify for this retrospective analysis, patients must have been

unconscious or amnestic for greater than or equal to one week. Of the 479 patients who met the inclusion criterion, 291 patients were alive and available 10 years after injury. After an extensive neurological evaluation, an unspecified selected series of tests of cognitive function were administered and relative reports of behavior were obtained.

In analyzing the results of testing Lewin et al. (1979) identified four types of neurophysical disability and eight types of mental disability. The neurophysical disabilities were labeled decerbrate dementia, athetoid pseudobulbar syndrome, brainstem cerebellar syndrome, and hemiparesis. The mental disabilities were characterized by dementia, memory difficulties, personality changes, and anxiety. Mental disability was closely related to injury severity and age at injury. The long-term outcome of severe head injury was accurately predicted by an algorithm that considered age at injury, maximum neurological disability, maximum mental disability, and duration of PTA. As in the Fahy et al. study previously cited, employment status was related to severity of mental, rather than neurologic, disability. At 10 years postinjury, 18% of the severely head injured individuals were totally or severely disabled, 49% of the individuals had recovered, and the remaining 23% of the individuals had died.

Long-term outcome following a severe head injury was also studied by Brooks et al. (1987). In their seven year

follow-up of 134 patients sustaining a severe head injury, defined as coma lasting 6 or more hours, neurosurgical operation, or PTA exceeding 2 days, patients and relatives were interviewed using a structured format. The interview format was designed to elicit changes in behavioral function following the head injury.

Relatives reported persisting cognitive and behavioral changes including altered personality, irritability, increased anger, depression, memory loss, and mood swings up to seven years postinjury. Brooks et al. (1987) noted the tendency of patients to underreport these changes. In further analyzing the data, the investigators found no reduction in symptom frequency from two to seven years postinjury with cross-sectional methods and increasing symptomatology with prolonged periods of PTA ($p \leq .05$).

Estimates of relative distress were calculated using the concept of subjective burden. It was determined that the distress experienced by the relatives of the severely head injured individual remained at medium to high levels over the seven year follow-up period. High burden levels were associated with more severe injuries, as measured by length of PTA, and with relative reports of behavioral and emotional deficits in the patient.

As a result of the above findings, Brooks et al. (1987) concluded that behavioral and emotional changes persisting after severe head injury are associated with longer periods

of PTA, hence more severe injury, and more subjective burden for relatives. Rehabilitation efforts should be designed to support family coping and minimize deficits in emotional and behavioral functioning.

Three studies examined social adjustment following severe head injury. Oddy and Humphrey (1980) followed 54 patients who had a period of PTA greater than 24 hours for two years following TBI. Patients and relatives were interviewed at 6 and 12 months and surveyed at 2 years to determine social adjustment, cognitive defects, and motor-sensory sequelae following severe head injury. A semi-structured interview, the Katz Adjustment Scale and a symptom checklist were utilized to collect data. Complete data were obtained for 35 subjects.

The data analysis revealed that while most patients had returned to work, fewer than 50% of the subjects had resumed their leisure activities (Oddy & Humphrey, 1980). The investigators advanced a motivational hypothesis to account for this phenomenon and recommended a rehabilitative approach that attended to social as well as physical aspects of rehabilitation. They additionally concluded that return to work was not a sensitive indicator of social recovery. More attention needs to be directed at other elements of social recovery including leisure activities, social contacts, marital and sibling relationships, as well as premorbid personality and its influence on postinjury recovery.

In another study conducted by Weddell, Oddy, and Jenkins (1980), 44 severely head injured individuals (PTA $\geq$ 7 days) between the ages of 16 and 39 years were compared to a control group on measures of neurophysical status (using the Bond Neurophysical Scale), personality, and social adjustment. Personality and social adjustment measures for the experimental group were obtained from a close relative through a semi-structured interview two years following the injury. Interrater reliability was reported to range between .71 and .98. The Raven Standard Progressive Matrices Test was administered to the head injured patients as a screening test of intellectual function. The control group consisted of the relatives of a selected group of similarly head injured individuals who were interviewed to determine social adjustment of their injured relative two months prior to the injury. Non-parametric tests of statistical comparisons were performed.

Weddell et al. (1980) reported that the relatives of the patients in the experimental group noticed increased irritability and increased affection behaviors as the most common personality changes. With regard to employment status, only 5 patients had returned to their previous jobs while 20 patients were not working at all. As regards leisure activities, a significant reduction in leisure activities and social contacts was present in the experimental as compared to the control group on all

parameters except number of social outings, social avoidance, and number of acquaintances. As for family relationships, significantly more friction was found in the experimental group as compared to the control group concerning both parental relations ($z = 4.25$, $p \leq .0001$) and sibling relations ($z = 2.92$, $p \leq .004$). Experimental patients who were reported to have experienced a personality change ($n = 31$) were less likely to be working ($p \leq .0004$), had fewer interests ($p \leq .005$), were more frequently bored ($p \leq .01$), were more dependent on their families ($p \leq .01$), and maintained less contact with friends ($p \leq .002$). Although severely head injured individuals were found to experience marked changes in the social sphere of function, adaptations were found in work, leisure, and family life.

The investigators concluded that return to work was determined by a mental as well as a physical component (Weddell et al., 1980). This mental component, comprised of personality changes and memory loss, should not be overlooked. Rehabilitation centers must increase their emphasis on coping with mental impairments and retraining techniques for intellectual and personality changes.

The third study investigated social recovery at six months following severe closed head injury (PTA > 24 hours) in 49 subjects between the ages of 16 and 39 years (Oddy, Humphrey, & Uttley, 1978). In order to allow comparisons of findings, a control group of 35 matched subjects for age and

socioeconomic status with extremity fractures were obtained. A close relative of the head injured subject was interviewed in a semi-structured format to determine preinjury level of social function; at 1, 6, and 12 months postinjury the relative completed the Katz Adjustment Scale, a task distribution checklist, and the Wakefield Depression Inventory.

The results of this study indicated that at six months 29 head injured subjects had returned to work at their preinjury level. This return was statistically significant for those subjects with a period of PTA of less than 7 days as compared with those subjects whose period of PTA was greater than 7 days ($r = .41$, $p \leq .003$) (Oddy et al., 1978). Both the control group subjects and the head injured subjects experienced a decline in leisure activities, suggesting that the experience of injury as an interruption of normal life may be the critical factor in altered leisure. Social contacts were found to be decreased in only those head injured subjects who experienced a period of PTA exceeding 7 days. As regards residual symptoms following injury, 77% of the head injured subjects and 42% of the control group subjects complained of residual symptoms. In the experimental group the most common symptoms were poor memory, loss of temper, and fatigue. The control group subjects most often complained of symptoms reflective of anxiety and depression. It was noted that while similar accounts of

residual symptoms were given by head injured subjects and their relatives (rho = .87), discrepancies were evident in individual cases.

Oddy et al. (1978) concluded that very severe head injuries (PTA > 7 days) were associated with greater impairment in social functioning at six months postinjury than severe head injuries (PTA ≤ 7 days) or extremity fracture. This impairment was believed to be the result of personality changes in the very severely injured subsample.

Another study examining short-term outcome of severe closed head injury was conducted by McKinlay, Brooks, Bond, Martinage, and Marshall (1981). In this study, the relatives of 55 severely head injured individuals (PTA ≥ 2 days) aged 16 to 60 years were interviewed to ascertain information regarding alterations in psychosocial functioning. The 90-item scheduled interviews were conducted at 3, 6, and 12 months postinjury.

It was found that mental changes, including impatience, irritability, bad temper, and personality change were not only reported more often but also were found to increase in frequency over time (McKinlay et al., 1981). An analysis of variance with Scheffe demonstrated that of the seven categories of altered function, emotional and subjective items were reported more often than language, physical, dependence, disturbed behavior, or memory items at all data collection times ($p \leq .01$). These alterations were also

associated with increased subjective stress experienced by the relative. The investigators noted that the association between emotional and subjective changes and family stress point to the need for rehabilitation programs to concentrate on the areas of mental and behavioral recovery.

In an effort to examine the impact of severe head injury on the family, Thomsen (1974) followed 50 severely head injured patients (unconsciousness $\geq$ 24 hours) for a period of up to 70 months. Follow-up neurological examinations and evaluations by a clinical psychologist and speech pathologist were obtained, on average, 30 months (range 12 to 70 months) after the injury. Interviews with relatives were completed at the time of follow-up examination.

On physical examination, 30% of the patients were determined to be without disabilities and 20% of the patients were considered severely disabled (unable to walk or severe gait disturbance). The remaining patients experienced problems such as hemiparesis, spasticity, or sensory losses. Neuropsychological testing using an investigator developed aphasia test and the WAIS revealed that 42% of the patients exhibited some language difficulty. Finally, Rorscharch testing was used to confirm any suspicion of personality changes noted during the testing period.

It was found that in spite of the presence of a variety of neurological disabilities and intellectual deficits, personality changes including irritability, hot temper,

aspontaneity, restlessness, emotional regression and lability, and stubborness were most troublesome for the family. The patients themselves rarely realized that any change in their behavior had taken place. Families frequently complained that no to little information was given to them during the acute hospitalization to prepare them for these changes.

Thomsen (1974) concluded that patients were unreliable sources of postinjury psychological sequelae. In addition, more attention needs to be directed to the education of the family regarding potential personality changes and to rehabilitative efforts directed toward these changes.

In an effort to determine the recovery process following severe head injury, Bond and Brooks (1976) followed 719 patients, pulled from four studies of severe brain injury (duration of PTA exceeding 24 hours), for two years. Instruments administered were the Bond Physical, Mental, and Social Scales and the WAIS (56 patients); the Glasgow Outcome Scale (719 patients at six months; 212 patients at one year); the WAIS (40 patients); and Raven's Progressive Matrices and Mill Hill Vocabulary Test (60 patients).

Bond and Brooks (1976) found that the greater part of recovery of physical and mental (memory, intellect, and personality) function, as measured by the study instruments, occurred within six months of injury. Later recovery was primarily concerned with adaptation to fixed disabilities.

At this time, premorbid personality and postinjury psychosocial alterations were found to have a major influence upon recovery.

The investigators concluded that the recovery process following severe head injury was not uniform for all effects. For example, verbal functions recovered at a faster pace than nonverbal (performance) functions. And, the more severe the initial injury, the sooner recovery curves plateaued. They recommended that further investigation of the effect of different rehabilitative techniques on return to maximum function be explored (Bond & Brooks, 1976).

Outcome Following Moderate TBI

Little attention has been directed toward studying individuals classified as having experienced a TBI of moderate severity. In one reported study, moderate TBI was described as intermediate in sequelae between severe and mild TBI. That study, conducted by Rimel, Giordani, Barth, and Jane (1982), was designed to determine the effect of moderate TBI on disability at three months postinjury.

Moderate TBI was defined as a GCS score of 9 to 12 six hours following hospital admission (Rimel et al., 1982). Of the 199 persons who had sustained a TBI of moderate severity, 170 patients were available for three month follow-up evaluation. At this evaluation the patients were asked to complete instruments designed to ascertain physical, social, and emotional complaints and financial, marital, and

employment status. All patients underwent a complete neurological evaluation and 32 patients completed neuropsychological testing. The tests administered were the Halstead-Reitan Battery, WAIS, Wechsler Memory Scale, and Wide Range Achievement Test.

Rimel et al. (1982) reported that their sample of moderate TBI subjects were slightly older and poorer and had a higher premorbid incidence of chronic unemployment and alcohol abuse as compared to mildly injured individuals drawn from a larger population of TBI patients. In examining outcomes at three months, the investigators found that 93% of the subjects complained of persistent headache, memory problems were reported by 90% of the subjects, 87% of the subjects had difficulty with activities of daily living or had experienced a change in financial status, and 62% of the subjects had experienced a change in their usual mode of transportation. Only 31% of the subjects were employed at three months postinjury. Predictors of unemployment in the moderate TBI patient were injury severity, length of coma, length of PTA, and discharge GCS score. On neuro-psychological evaluation, impairments in higher cognitive functions, new problem solving skills, focused attention and concentration, and memory were found.

In discussing the findings, Rimel et al. (1982) concluded that the problems reported by moderately brain injured individuals were of the same nature, but occurred

with greater frequency and severity when compared to the problems reported by more mildly injured individuals. The finding that unemployment was best predicted by indices of injury severity in moderate TBI demonstrated the extent of brain damage produced by a moderate injury. The investigators recommended that treatment modalities be identified that will limit the effects of moderate TBI in the acute postinjury period in the hopes of improving outcome by improving GCS score at discharge.

Outcome Following Mild TBI

Several studies have been reported that investigated psychosocial outcome following mild TBI. Rimel, Giordani, Barth, Boll, and Jane (1981) reported on a large prospective study designed to determine the effect of mild head injury on outcome at three months postinjury. Mild head injury was defined as a GCS score of 13 to 15 on admission with a period of unconsciousness lasting less than 20 minutes.

During the 20 month study period, 538 patients experienced a mild head injury. At three months postinjury, 424 patients were available for further study. At follow-up, psychosocial data were collected concerning physical, social, and emotional complaints using a Schedule of Recent Events (SRE) designed to elicit information about the occurrence of stressful situations since hospitalization and a brief physical recovery checklist was completed. A complete neurologic examination was performed on all patients and 69

patients completed neuropsychological testing comprised of the Halstead Neuropsychology Battery, WAIS, Wechsler Memory Scale, and Wide Range Achievement Test.

The investigators found that 78% of the subjects complained of persistent headache and 59% of the subjects reported memory problems (Rimel et al., 1981). Interestingly, relatives indicated more problems with memory than did the patients. On neuropsychological testing, deficits were noted in attention, concentration, memory, and judgement. Of most significance is the finding of a 24% unemployment rate at three months. Unemployment was related to age, education, occupational level, income, and socioeconomic status. Employed subjects were older ($p \leq .05$), had a higher level of education ($p \leq .001$), had a higher occupational level ($p \leq .005$), had a greater income ($p \leq .01$) and were in a higher socioeconomic status ($p \leq .001$) as determined by premorbid data than were unemployed subjects. The investigators hypothesized that motivational factors or resource availability factors might account for the observed differences. In addition, it was noted that a greater percentage of unemployed persons experienced memory problems.

The findings are particularly significant for the recovery of the head injured individual. That deficits occur and are noticed by the individual following a mild head injury is an important area of concern for the health care

provider. If not prepared for the possibility of these deficits, patients and families may not understand the continued presence of difficulty in resuming the premorbid life style. This may lead to anxiety, frustration, and eventual psychologic incapacitation. Therefore, it is imperative that the health care provider, through education, encouragement, reassurance, and support guide the patient to an understanding of the sequelae of mild head injury to promote full rehabilitation.

O'Shaughnessy, Fowler, and Reid (1984) investigated cognitive function in 39 consecutive patients admitted to a large medical center with a minimal closed head injury defined as hospital admission of more than 24 hours but less than 2 weeks with initial neurological findings of lethargy, confusion, unconsciousness, amnesia, or disorientation. Using subtests of the WAIS; the Erickson Memory Scale (EMS); the Paced Auditory Serial Addition Test (PASAT); Trail Making Test, Trails A and B; Part IA of the Edwards Personality Inventory Scales; and a Social Leisure form, the subjects were tested within one week of injury and again at six months after injury by the same psychometrist.

O'Shaughnessy et al. (1984) found improvements in all aspects of cognitive function at the time of repeat testing. This improvement was most evident in tests of motor speed, new learning, and memory. Additionally, performance on the PASAT was positively correlated with judgements, by close

associates of the patient, of changes in level of functioning ($\underline{X}$ = 18.63, $\underline{p} \leq .01$). As a result of the findings, the authors concluded that psychometric tests, such as the PASAT, Trail Making Test, and Edwards Memory Scales, provide a useful measure of brain dysfunction in the minimally head injured individual. These tests are better markers of altered function than estimates of PTA. Their use should be considered in the determination of the effect of brain injury on brain function.

In an effort to identify interventions to facilitate restoration of social competence in minor head injury patients, Hinkle, Alves, Rimell, and Jane (1986) conducted an experimental, three-group-design study. The sample of 1,092 mild head injury (defined as a GCS score between 13 and 15 at admission) patients were randomly assigned to one of three treatment protocols--routine care, information, and information plus reassurance. Data collection was by means of a chart review and a psychosocial interview at 3, 6, and 12 month intervals. Interviews were either conducted in a clinic setting or by telephone.

No statistically significant differences were identified for the effect of the independent variable on return to work or return to social activity (Hinkle et al., 1986). If the information and information-plus-reassurance conditions were combined, a statistically significant relationship between this combined treatment condition and mean days to return to

social activity was evident ($\underline{X}$ = 10.56, $\underline{p} \leq .05$). The investigators concluded that the experimental interventions did facilitate return to normal social functioning. The sharing of information relative to the potential effects of mild head injury should be incorporated in the care nurses provide this patient. This information may shorten social morbidity by as many as six days and facilitate the patient's coping with posttraumatic symptoms that often occur.

Gronwall and Wrightson (1974) investigated the time course for return of intellectual function in 100 patients who had experienced a minor head injury. Minor head injury was defined as a concussion with an associated length of PTA of less than 24 hours. Three subgroups of subjects were identified in the sample. Group 1 was comprised of 10 males who had sustained a concussion and returned to work, but were unable to continue working as a result of postconcussive symptoms. In group 2 were 10 males who had sustained a concussion and were admitted to the hospital within two hours of the injury. The subjects in group 2 were comparable to those in group 1 on the variables of age and education. Group 3 was comprised of 80 males and females who had been followed by the investigators since their admission shortly after head injury. All subjects were administered the PASAT as a measure of intellectual function. The timing of PASAT administration varied slightly between groups. Subjects in group 1 were initially tested on referral; repeat testing was

performed at weekly intervals until scores normalized. Group 2 subjects were tested within 24 hours of the injury, while subjects in group 3 were initially administered the PASAT within 48 hours of the injury. In both groups 2 and 3, subjects were retested at unspecified times during hospitalization and between 30 and 35 days after the injury.

In analyzing the data, Gronwall and Wrightson (1974) found that all concussed subjects had initial PASAT scores that were below normal control values. And, poor intellectual performance on the PASAT was correlated with postconcussive symptoms. The analysis of recovery curves of intellectual function demonstrated improvements in performance over time. In general, following minor head injury, recovery of intellectual function proceeded over a time course of 35 days. By five weeks postinjury most subjects (100% of group 2 subjects and 94% of group 3 subjects) had regained normal intellectual function as measured by the PASAT.

As a result of the findings, the investigators recommended a rehabilitation program that bases return to work on PASAT performance. Patients should have an initial follow-up examination at four weeks postinjury to assess intellectual function. Those individuals with delayed recovery of function should enter a formal rehabilitation program. In addition to its clinical implications this study demonstrated that the usual recovery curve for intellectual

behavior following mild TBI is approximately 35 days in length.

Outcome Across TBI Severity Levels

A beginning effort has also been made in the investigation of different severities of head injury on neuropsychological recovery. Dikmen, Reitan, and Temkin (1983) followed 27 patients aged 15 to 44 years for 18 months following head injuries ranging in severity from mild to severe. A control group of 35 subjects, not significantly different for age or education who were friends of another group of head injury patients, were utilized for comparison purposes. The Halstead Neuropsychological Test Battery and the Trail Making Test were administered initially and again at 12 and 18 months to all subjects. On the basis of the tests the investigators noted the following: (a) a broad range of early deficits, more pronounced for higher-level neuropsychological functions, occurred; (b) improvements occurred in both simple and complex functions; (c) earlier conclusions regarding the time frame of recovery may be premature; and (d) the initial degree of deficit determined subsequent degree of recovery and residual deficits.

McLean, Dikmen, Temkin, Wyler, and Gale (1984) investigated psychosocial functioning at one month following head injury in injuries classified as mild to severe based upon the duration of PTA, the GCS score, and the time to following commands. The experimental group was comprised of

102 head injured patients between the ages of 15 and 60 years. A control group of 102 subjects drawn from friends of the experimental group was selected. Testing involved completion of the Sickness Impact Profile (SIP), the Modified Function Status Index, a Head Injury Symptom Checklist, a Self-Perception of Overall Functioning Scale, and a structured interview.

All experimental injury severity subgroups were found to significantly differ from the control group (McLean et al., 1984). No statistically significant differences were found on the measures among the head injury severity subgroups, although a trend toward decreased ratings on the SIP total dysfunction score and self-perception of functioning was noted with decreasing severity of injury. In addition, an inverse trend between injury severity and amount of emotional distress was noted. This trend may reflect the greater awareness of deficits experienced by the more moderately injured individual. In conclusion the investigators stated the following: (a) at one month postinjury head injured individuals experience difficulty in many areas of psychosocial functioning, especially in the areas of resumption of social roles and leisure activities; (b) at different severity levels of injury, different functions were affected; and (c) the similarity of the control group to the preinjury character of the head injured patient is essential for the determination of the significance of symptom

frequency.

The importance of social competency to head trauma rehabilitation across injury severity levels was demonstrated by Lezak (1987). A volunteer group of 42 mixed severity, white males comprised the study sample. All subjects were examined following the resolution of PTA; most were additionally tested between four and six weeks following return to consciousness, in the last six months of the first year of injury, in the second and third, and in some cases, fourth and fifth years postinjury. The Portland Adaptability Inventory (PAI) was used to measure temperament and emotionality, activities and social behavior, and physical capabilities. The PAI, a measure of objective behavior, was completed by Lezak.

In analyzing the data, Lezak (1987) noted that three patterns emerged: (a) continuing dysfunction involving social contact, work/school, and leisure activities; (b) early problems of anxiety and depression; and (c) improvements in initiative and self-care over time. These patterns indicated the presence of continued impairments in executive functions (i.e., initiating, planning, monitoring, evaluating) as a result of head injury lasting at least five years from the date of the injury. These impairments interfere with the patient's ability to find and keep a job, complete school work, and make and maintain friends. Lezak (1987) concluded that rehabilitation strategies need to be

targeted at enhancing executive functions in the head injured individual.

Summary

In reviewing the literature related to self-concept alterations following a variety of disabilities, it was evident that changes in measured self-concept were common. Self-concept declined following several types of illnesses or injuries. After a period of rehabilitation, self-concept was restored to normal or near-normal levels. The restoration of self-concept was believed to be the result of the rehabilitative process, including improvements in physical condition as well as psychological outlook.

While the review of the literature documented self-concept changes associated with many disabling conditions, it was clear that one could not assume that self-concept invariably declined following all injuries or illnesses. Studies that failed to demonstrate self-concept changes following mastectomy for breast carcinoma were illustrative of this fact.

The available studies that examined self-concept following severe head injury, however, demonstrated that self-concept did decline with severe brain injury. These studies were limited by small sample sizes. In addition, the instruments used to measure self-concept in the Tyerman and Humphrey (1984) study had no reported reliability or validity

data. It was therefore difficult to generalize their findings beyond their sample.

Studies are needed that examine self-concept following traumatic brain injury across the spectrum of severities of brain injuries. No studies were found that examined self-concept following moderate or mild head injury. Yet, mild head injury is the most frequent of all types of head injury. Lastly, no studies were found that examined self-concept and outcome following a traumatic brain injury.

Outcome studies following traumatic brain injury are increasingly found in the literature. These studies clearly demonstrated the frequency and extent of neurobehavioral sequelae following a traumatic brain injury. The documented sequelae consisted of alterations in higher cortical functions--the executive functions of initiating, planning, organizing, and monitoring behavior. Also documented were problems with memory, attention, concentration, information processing, and problem solving. As a result, high levels of social morbidity were found.

The traumatically brain injured individual tended to experience a decline in work and leisure activities, a decrease in the number of individuals in the friendship network, poor social interaction skills, poor social adjustment, and increased amounts of family conflict. While the degree of social morbidity following traumatic brain injury appeared to be a function of the severity of the

injury, elements of each of the outcomes had been found at all severity levels. Mild, moderate, and severe traumatic brain injuries all resulted in some degree of social morbidity. It was believed that this social morbidity had an impact on self-concept.

Self-concept is socially defined. One's self-concept develops from social experiences and changes as a result of social experiences. Therefore, it was reasonable to posit that an outcome of mild traumatic brain injury is an alteration in self-concept. However, the validity of this assumption was not known. As a result of this lack of knowledge, a description of self-concept following mild traumatic brain injury was needed.

C H A P T E R I I I

Design and Methodology

In this chapter the research design and methodology is described. This description covers the study sample, the procedure for obtaining permission to conduct the study, the data collection procedure, the instruments, and the procedure for data analysis.

Research Design

The study was a descriptive study designed to determine the self-concept of individuals who had sustained a mild TBI at the expected endpoint of maximum recovery of function following the occurrence of the injury. Maximum recovery of function was expected to have occurred within six weeks of a mild TBI. Self-concept measures, therefore, were obtained between six weeks and three months postinjury.

At the time of testing, measures of neuropsychological function were obtained. These measures were used to determine the existence of any relationships between neuropsychological outcome following mild TBI and self-concept.

The study was conducted in two community hospitals that provided acute care and emergency services in Southeastern New Hampshire. The hospitals were staffed by neurosurgeons and served as referral centers for neurosurgical disorders.

Sample

The sample for this study was comprised of all patients who were admitted to the test facilities' Emergency Department or were hospitalized for a diagnosis of head injury unassociated with spinal cord injury. In order to qualify for inclusion in the study, the subject was examined by a registered nurse (RN), physician (MD), or their designee within one hour of admission to the health care system. At the time of examination a Glasgow Coma Scale (GCS) score was obtained and documented in the patient's record. Only those patients assigned a GCS score of 13 to 15 were entered into the study as potential subjects.

The GCS (Appendix A) is a 13-point scale designed to measure level of consciousness. The scale ranges from a score of 3 to a score of 15 based upon best neurologic function in three areas--eye opening, motor response, and verbal response. The patient is tested and scored in each area. The individual scores are summed to give a total GCS score (Teasdale & Jennett, 1974). The score is highly reliable; disagreements among raters are reported to be less than 3% (Teasdale & Jennett, 1976). In addition, the GCS is a valid index of injury severity (Becker et al., 1977; Eisenberg, 1985). In using the scale to classify injury severity levels, mild TBI is defined as a GCS score between 13 and 15. Moderate TBI is defined as a GCS score between 9 and 12, while a GCS score between 3 and 8 indicates severe

TBI.

To qualify for inclusion in the study, subjects were between 18 and 40 years of age, high school graduates, and able to read and write English at the time of testing. Any subject with a documented previous psychiatric history and any subject who was pregnant were ineligible for study participation. Finally, subjects had to be available for and participate in data collection at the specified time postinjury and consent to study participation.

The sample was comprised of all subjects who met the inclusion criteria and were admitted to the test facilities between March 18, 1988 and September 5, 1988. Subjects were consecutively selected through a review of emergency department records. Only those subjects who volunteered to participate were included in the study sample.

Procedure

Protection of Human Subjects

The study proposal was submitted to the Boston University School of Nursing Institutional Review Board for initial approval. Once university approval was obtained, the study was submitted to the participating hospitals' Human Subjects at Risk Committees for approval. Finally, all study participants were given a written informed consent (Appendix B). This form guaranteed the anonymity of the participant and assured the strict confidentiality of all study

materials. Additionally, the form provided for withdrawal from participation at any time, allowed for the refusal to answer specific questions, and assured the participant that decisions relative to study participation would not affect present or future health care services associated with the head injury. Signing this form denoted their willingness to participate in the study.

Procedure for Obtaining Subjects

Once all permissions were obtained, the investigator reviewed emergency room records to identify potential study participants. In order to facilitate appropriate patient identification, the International Classification of Diseases (ICD-9) code system was used to identify potential participants. The codes that were searched were ICD-9 codes 310.2 (postconcussion syndrome), 800-804 (fractures of the skull and/or face), 850-854 (intracranial injuries), and 873 (open head wounds). Charts were pulled within these codes that corresponded to a date of injury consistent with study requirements. That is, once all permissions were obtained, records were reviewed for the period beginning March 18, 1988 and ending the Saturday prior to the date of record review to identify individuals diagnosed as sustaining a mild head injury. The procedure to identify potential subjects was then performed on an every fourth week basis, reviewing the prior four week period through September 5, 1988.

Once a potential subject had been identified, the

following procedure to secure participation in the study was performed. The investigator contacted the potential subject by telephone to ascertain interest in participation in the study. If the individual expressed a willingness to participate in the study an appointment for testing was made. Testing was performed at a quiet location within the hospital whenever possible. When necessary, testing was completed in the subject's home or place of employment.

The investigator offered and most subjects requested that a telephone call be made prior to testing to verify the appointment. At the time of testing, the subject was asked to read and sign the informed consent, sign the permission to release a copy of the high school transcript (Appendix C), and complete all study instruments. In order to assure anonymity each subject was assigned a code number that was used to identify all study instruments.

Instrumentation

Once informed consent was obtained, the subject was asked to sign a release form permitting the researcher to obtain one copy of the high school transcript. The purpose for obtaining high school transcripts was to provide a general awareness of the neuropsychological functioning of the subjects prior to the occurrence of the TBI. Academic performance in high school as indicated by grade point average (GPA) provided an estimate of premorbid functioning

from which conclusions could be drawn about postinjury functioning. That is, there needed to be some assurance that the subjects had normal neuropsychological functioning prior to the injury in order to link postinjury deficits to the injury. Since scores on accepted tests of premorbid neuropsychological function were not available, academic performance in high school provided an estimate of premorbid function.

After signing the release to obtain one copy of the high school transcript, the subject completed an investigator-developed demographic profile (Appendix D). The demographic profile was used to gather data regarding age, marital status, education, occupation, current employment status, income, number of previous head injuries, and the presence of any residual physical disabilities. The investigator noted on the demographic profile the TBI severity as determined by the initial GCS score recorded in the patient's record by the RN, MD, or their designees. Upon receipt of the high school transcript, the grade point average and class rank at graduation (if available) were entered on the demographic profile.

Upon completion of the demographic profile, the subjects completed in order the Rosenberg Self-Esteem Scale (RSES), the New York State Stability of Self Scale (SSS), and the Self-Consciousness Scale (SCS). Following completion of these instruments, the subjects were administered the

Auditory Digit Span subtest of the Wechsler Adult Intelligence Scale-Revised (WAIS-R); the Trail Making Test, Parts A and B; the California Verbal Learning Test (CVLT), and the Paced Auditory Serial Addition Test (PASAT). These measures of neuropsychological function were administered in the order listed above.

As discussed earlier in Chapter 1, the four tests of neuropsychological function were selected to provide a battery of tests that could be administered in a reasonable period of time (no more than one hour) and that would assess all of the functions of intellectual behavior as described by Lezak (1983). The selected tests measured the functions recommended by Ruff et al. (1987) for neurobehavioral assessment of the individual who had sustained a mild head injury. In the following discussion of the study instruments, the specific intellectual functions measured by each test are enumerated.

Each subject was then asked an open-ended question designed to provide insight into important aspects of their lives following the TBI. The question specifically asked the subject to describe the events and feelings that occurred postinjury which they believed nurses should be aware of (Appendix E).

Rosenberg Self-Esteem Scale

The RSES is a 10-item instrument that requires the respondent to select the extent to which they agree or

disagree with statements about the self (Appendix F). Respondents may strongly agree, agree, disagree, or strongly disagree with each statement. Originally developed as a Guttman scale, the RSES has a Coefficient of Reproducibility of 92% and a Coefficient of Scalability of 72% indicating satisfactory internal reliability. The test-retest reliability of the RSES has been reported between .85 and .88 (Rosenberg, 1965).

Rosenberg (1965) reported that face, construct, convergent, and discriminant validity have been demonstrated for the RSES. Construct validity was established by demonstrating the negative relationship between self-esteem and depressive effect (r = .3008) and self-esteem and anxiety (r = .4848). Self-esteem, as measured by the RSES, was convergent with four other methods of measuring self-esteem (r = .56 to .83) and discriminant using monotrait-heteromethod correlations (r = .53).

O'Brien (1985) reported that the RSES is a unidimensional scale when scored using an additive Likert format (eigenvalue = 5.28 accounting for 52.8% of total variance). The RSES is frequently scored using the Likert format with results comparable to those obtained with Guttman scoring procedures (Rosenberg, 1979).

The Likert scoring format was used in this study. The self-esteem score was the summated score obtained across the 10 items. The scores can range between a numerical value of

10 (high self-esteem) and 40 (low self-esteem).

Stability of Self Scale

The SSS is a five item scale that measures self-consistency (Appendix G). The respondent is asked to indicate the response, from a range of two to four possible responses, which best describes the self.

Also developed as a Guttman scale, satisfactory internal consistency is evidenced in a Coefficient of Reproducibility of 94% and a Coefficient of Scalability of 77% (Rosenberg, 1965). Tippett and Silber (1965) reported a reliability coefficient of .50 with interview ratings of self-concept stability. In using the SSS to test Rosenberg's model of self-concept, Elliott (1986) and Elliott, Rosenberg, and Wagner (1984) reported a Cronbach's alpha score of .649.

Franzoi and Reddish (1980) performed a factor analysis of the SSS using summation scoring on a nine-point Likert scale. They determined that the SSS is a unidimensional measure of self-stability (eigenvalue = 3.19 accounting for 56% of total variance) and concluded that "the Stability of Self Scale is preferable to other measures if one is interested in obtaining a general measure of the concept [self-concept stability]" (Franzoi & Reddish, 1980, p. 1161).

The Likert scoring format was used to score this instrument. The self-consistency score was the summated score across the five items. The scores can range between a value of 5 and 13; low scores represent high levels of self-

consistency.

Self-Consciousness Scale

The SCS is a seven-item Guttman Scale with a Coefficient of Reproducibility of 89% and a Coefficient of Scalability of 63% (Rosenberg, 1979) (Appendix H). Respondents are asked to indicate one out of two to three possible responses to questions designed to ascertain the salience of the self. In using the SCS to test Rosenberg's self-concept model Cronbach's alpha was reported to be .650 (Elliott, 1986; Elliott et al., 1984).

The scale was developed originally for use in investigating the salience of self-concept in a sample of children. The word choices, but not the intent, of the items on the instrument were changed to be consistent with an adult sample. For example, item one "Let's say some grownups or adult visitors came into class and the teacher wanted them to know who you were..." was changed to read "Let's say a visitor came into your office and your boss wanted them to know who you were...".

The Likert scoring format was used to score this instrument. The self-consciousness score was the summated score across the seven items. Scores can range between a value of 7 and 18 with higher scores indicating higher self-consciousness.

Auditory Digit Span

The Auditory Digit Span subtest of the WAIS-R requires

the subject to recall several pairs of random number sequences read aloud at the rate of one digit per second. In Digits Forward (a test of recognition and attention), the subject recalls the digits in the order in which they are presented. Digit sequences are presented until two nine digit sequences are correctly repeated or the subject misses two trials at a specified length. One point is awarded for each digit sequence correctly repeated; the maximum Digits Forward score is 14 points.

In Digits Backward, the digits must be repeated in the exact reverse order of presentation; this requires storing information in short-term memory. Two trials of sequences of between two and eight numbers are presented at the rate of one digit per second. Again one point is scored for each sequence correctly repeated in the reverse order of presentation. The maximum Digits Backward score is 14.

The raw Digit Span score is the sum of the Forward and Backward scores. This raw score is converted to a scaled score using age appropriate conversion charts (Wechsler, 1981). Both conditions require approximately five minutes total time for completion.

The reliability of the Digit Span subtest of the WAIS-R was determined utilizing test-retest administration with four of the nine WAIS-R age groups. Satisfactory reliability (average $\underline{r}$ = .83) was established for this subtest. The average standard error of measurement for scaled digit span

scores was reported to be 1.23. This standard error value indicated that the `true' digit span scaled score of an individual was within 1.23 scaled score points around the obtained score (Wechsler, 1981). Wechsler (1981) reported the validity of the WAIS-R as a measure of general intelligence to be widely accepted. The WAIS-R is scaled such that the mean score is 10 with a standard deviation of 3.

Lezak (1983) recommends using uncorrected raw scores to determine digit span performance. With digits forward, a span of six or better reflects normal performance, a span of five reflects marginal performance, a span of four indicates borderline performance, and a span of three or less reflects defective performance. In the digits backward condition, spans of four or better are considered normal, while spans below this level reflect abnormal performance. In this study the total Digit Span score was the scaled score; Digits Forward and Digits Backward were the uncorrected raw scores.

Becker (1975) found Digit Span to be one of two WAIS-R subtests in which head injured subjects showed improvement with time when compared to matched controls. In the head injury population, poor digit span forward performance immediately following the injury generally improved with time; however, abnormal backward condition performance rarely improved over time (Lezak, 1983).

Trail Making Test

The Trail Making Test is a measure of attention, visual conceptual and visuomotor tracking, and motor speed. It is highly sensitive to the effects of brain injury (Lezak, 1983). Given in two parts, A and B, the subject must draw lines to connect 25 consecutively numbered circles (Part A) and 25 consecutively numbered (1-13) and lettered (A-L) circles, alternating between numbers and letters (Part B). The circles are distributed over a sheet of white paper. The subject is instructed to make the connections as quickly as possible without removing the pencil from the paper (Reitan, 1958).

The test takes approximately 5 minutes to complete. The administration procedure recommended by Reitan (1955, 1958) was used to administer this test. In this procedure, the total time, in seconds, required for error free performance was determined. The raw score, in seconds, for each test was converted to a percentile score utilizing the age appropriate norms of Davies (1968). Lezak (1983) reported the reliability of each part of the Trail Making Test to be satisfactory with a coefficient of concordance of .78 for Part A and of .67 for Part B.

California Verbal Learning Test

The CVLT requires approximately 20 minutes to administer. This test measures verbal learning and remembering functions including immediate memory span,

learning strategies, interference tendencies, confusion or confabulation, and retention (Delis, Kramer, Kaplan, & Ober, 1987). The test measures how, as well as how much, learning of verbal material occurs.

In this test, the subject is given 5 auditory presentations of a 16-word list at the rate of one word per second and immediately asked to recall as many words as possible. Following the 5 trials using the same list of words, a second list of 16 different words (interference condition) is presented. Again, the subject is asked to immediately recall as many words as possible from the second list. Immediately following the interference condition, a trial of free followed by cued (by semantic categories) recall of the first 16-word list is performed. Memory studies with traumatically brain injured individuals reveal fewer recalled words per trial and significant drops in recall (three or more words) often occurring after the interference condition (Lezak, 1983). A 20 minute delay ensues during which nonverbal tests are administered. Following this delay, the subject is assessed for free recall, cued recall, and recognition of the first 16-word list. The recalled words are recorded for all trials by the examiner in the order in which they are recalled by the subject.

The subject's scores are the number of words recalled correctly in each trial. Eight primary (recall) scores are

obtained; these scores provide an overview of the subject's learning and memory performance. In addition, learning characteristics, recall errors, recognition measures, and contrast measures can be obtained. The raw scores are converted to established age-specific T-score and standard score equivalents (Delis et al., 1987). The equivalent T-score mean is 50 with a standard deviation of 10; standard score means are 0 with a standard deviation of 1.

Three methods were utilized to determine the internal reliability of the CVLT recall scores. The coefficients obtained with each method were: Spearman-Brown coefficient of .92 for consistency across the five trials of List A, split-half coefficient of .77 with coefficient alpha of .74 for semantic categories, and an odd-word/even-word coefficient of .70 with a coefficient alpha of .69. The stability of the CVLT was reported to range between coefficients of .12 to .79 for each measured variable. Of the 18 variables on the CVLT, 13 variables had coefficients that were statistically significant at an alpha of less than .05. The reported coefficients of internal consistency and stability supported the reliability of the CVLT (Delis et al., 1987).

Factor analysis was used to demonstrate the construct validity of the CVLT. A six-factor solution supported the multiple learning indices assessed by the CVLT. According to Delis et al. (1987) the variables that loaded ($\geq$ .4) into

each factor cluster in a manner that is consistent with the learning and memory constructs that are measured by the CVLT. Criterion-related validity was established using an appropriately adapted version of the Wechsler Memory Scale (WMS). The variables that comprise the CVLT were correlated with the subtests of the WMS. Sixty-four percent of the correlations were significant at an alpha level of less than .05 (Delis et al., 1987).

Paced Auditory Serial Addition Test

The PASAT is a measure of attention, mental tracking, and speed of information processing (Appendix I). The test consists of four trials; during each trial 61 digits are presented by an audiotape at a constant speed. The speeds of digit presentation per trial are 2.4, 2.0, 1.6, and 1.2 seconds apart respectively. The subject is instructed to add each digit to the digit presented immediately prior and give the resulting sum aloud. The procedure recommended by Gronwall (1977) was used for test administration.

The PASAT was scored by calculating the number of correct and the number of error responses for each trial. The correct responses were converted to time per correct response scores. The times across all four trials were then examined for variability. Times cannot vary by more than a 0.6 second difference from all other trials on three of the four trials for the data from the testing session to be considered reliable. An error proportion score was

calculated across all four trials. The error proportion should be less than 0.1; if the score exceeds 0.2 then interpretation of the PASAT as a measure of attention is difficult (Gronwall, undated). If the data from the testing session were determined to be reliable and valid indicators of attention and concentration, then the mean time score was calculated by averaging the time per correct response scores across the usable trials (Gronwall, 1977; O'Shaughnessy et al., 1984). The control mean time score is 3.2 seconds with a standard deviation of 0.25.

As noted in Lezak (1983), the PASAT, as an extremely sensitive test of information processing, is commonly abnormal following concussion. Gronwall and Wrightson (1974) reported that this test is especially useful in examining heterogeneous populations; test scores are insignificantly correlated with mathematical ability and general intelligence. This test requires approximately 20 minutes to complete.

Data Analysis

As is consistent with descriptive studies, data analysis initially involved obtaining measures of frequency, central tendency, and variability that allowed a description of the self-concept of individuals who had sustained a mild TBI. Correlations among the three dependent measures of self-concept were determined.

Next, the variability of GCS scores was determined by examining the descriptive statistics. The intent was to obtain scatterplots to determine the existence and shape of any relationship between TBI severity within the range of mild injuries and each one of the three self-concept measures. The lack of variability in GCS scores precluded this analytic step.

Multiple regression analyses were to be performed to determine the effects and the strength of the effects of neuropsychological outcome on self-concept provided a sample size of 68 subjects was obtained. This size was needed to provide enough power (.80) at a medium effect (.30) to demonstrate relationships at an alpha level of .05 (Cohen, 1977). Since this size sample was not obtained correlational statistics, specifically the Pearson Product Moment, were performed. Each separate measure of self-concept was correlated with the four measures of neuropsychological outcome. Multivariate procedures were not performed; this decision was based on the desire to clearly identify the separate impact of neuropsychological outcome on each measure of self-concept. For all tests of statistical significance, alpha was set at .05.

Finally, a content analysis of the responses to the open-ended question was performed to identity the major themes evident in the responses obtained.

Methodological Limitations

The following methodological limitations were identified in the study design:

1. There may have been sample bias in the study due to the volunteer nature of participation. The investigator acknowledges that unidentified systematic factors may have been in operation that affected potential subject's decisions regarding participation in the study.

2. There was no way to control the variability of subjects by injury severity level (that is, the number of subjects receiving a GCS score of 13, 14, or 15) or neuropsychological outcome. Unequal sample representation limited the data analyses performed. This limitation may have altered the findings in such a way as to limit their generalizability.

3. The self-report nature of the self-concept measures was open to subjective bias by the respondents. Therefore, the scores obtained could have been influenced by factors other than true perception.

4. The self-concept instruments were not originally designed to be scored in the Likert format. This scoring method could have influenced the interpretation of the findings.

Summary

The current study was designed to describe the self-

concept of persons at the expected endpoint of maximum recovery of function following a mild traumatic brain injury. Self-concept was measured using three instruments developed by Rosenberg--the Self-Esteem Scale, the Stability of Self Scale, and the Self-Consciousness Scale.

In examining self-concept following mild TBI, an attempt was made to determine the relationship between severity of the mild TBI and self-concept. Severity of injury was determined using the GCS. The lack of variability in GCS scores eliminated this planned analysis. Correlational procedures were performed to identify the existence and strength of any relationships between neuropsychological outcome and self-concept after a mild TBI. The PASAT, Trail Making Test, Digit Span subtest of the WAIS-R, and the California Verbal Learning Test were used to measure neuropsychological outcome.

After obtaining appropriate institutional consents, potential subjects were identified through emergency room chart reviews and telephoned to ascertain willingness to participate in the study. All individuals who demonstrated a willingness to participate and who met the study's inclusion criteria, were included in the study sample. Appointments for testing each subject during the appropriate time interval were made by the investigator. At the time of testing, subjects signed the consent form and the permission to release a copy of the high school transcript and completed

all study instruments and neuropsychological tests. Descriptive statistics, correlational procedures, and content analysis were used to analyze the data obtained.

C H A P T E R I V

Data Presentation and Analysis

The data are presented and analyzed in this chapter according to the research questions. Prior to data analysis, a description of the study sample is presented. The chapter concludes with the content analysis of the responses to the open-ended question asked of all study participants regarding changes in abilities or feelings since the mild head injury.

Description of Study Sample

The study sample was comprised of those persons who were admitted to the test facilities' emergency department between March 18, 1988 and September 5, 1988 with a primary diagnosis of mild head injury who met sampling criteria and agreed to participate in the study. In reviewing the registration logs for participants, 152 potential subjects were identified at Test Facility A and 138 potential subjects were identified at Test Facility B. Of the 152 potential participants at Test Facility A, 70 persons were able to be contacted by telephone, 66 persons met the criteria for inclusion in the study, and 26 persons agreed to participate. Of these individuals, 19 persons kept the testing appointment and were included in the study sample. Of the 138 potential participants at Test Facility B, 67 persons were able to be contacted by telephone, 65 persons met the criteria for study

participation, and 21 persons agreed to participate. All of these individuals kept their testing appointment and were included in the study sample. The final sample was comprised of 40 subjects giving a response rate of 30.5%.

Slightly more males (n = 22) than females (n = 18) were represented in the sample. The mean age of the participants was 27.7 years (SD = 6.7 years). With respect to marital status, 50% of the participants (n = 20) were married, 42.5% of the participants (n = 17) were single, and the remaining subjects were divorced. As regards education, 24 participants had obtained either a high school diploma or graduate equivalency degree (GED) as the highest educational level. The remaining 16 subjects had between one and eight years of post secondary education. The mean level of education was 13.15 years (SD = 1.80 years). The occupational and employment characteristics of the sample revealed that the majority of subjects were employed full time (n = 32) in occupations categorized as manual (n = 20). Twelve subjects held professional or managerial positions while seven subjects engaged in clerical work. The median annual income of the sample was $19,500 (M = $19,921; SD = $11,000) with salaries ranging between no income and $50,000.

When queried about previous head injuries that required medical evaluation, 24 participants denied previous head injuries, 10 participants had sustained one prior head injury, and the remaining individuals had two (n = 2), three

(n = 2), or six (n = 2) prior head injuries. When prior head injuries were reported, subjects were questioned to assure the injury resulted in some form of emergency medical care.

In order to provide some measure of the premorbid neuropsychological function of the study participants, questions regarding school performance were incorporated into the demographic data sheet and high school transcripts were requested from the registrar of each subject's high school. In analyzing the participants responses with regard to school difficulties, two subjects reported reading problems, six subjects reported spelling problems, and seven subjects reported problems with math. Four subjects attended special education classes and eight participants repeated at least one grade in school. When questioned as to the reason for grade repetition, the majority of these eight individuals reported that either their parents voluntarily had them repeat an early grade for maturity reasons or they lost interest in school in the later grades and repeated from lack of motivation or effort.

High school transcripts or GED reports were received for 36 of the 40 participants. Due to highly variable grading methods and nonreporting of grade point averages, comparisons among subjects based upon GPA were not possible. While class rank was reported for 27 of the 34 participants with high school diplomas, the rankings were often unaccompanied by class size making comparisons among subjects difficult.

As a measure of the sequelae of their head injuries, subjects were questioned regarding common symptoms associated with head injury. The frequency of symptom reporting is presented in Table 1.

Table 1

Number and Percentage of Subjects Reporting Postinjury Symptoms

Symptom	n	%
Headache	13	32.5
Dizziness	8	20
Problems with balance	8	20
Visual problems	6	15
Weakness in an arm or leg	5	12.5
Problems with coordination	5	12.5
Memory problems	5	12.5
Numbness in an arm or leg	3	7.5
Problems with walking	3	7.5
Insomnia	3	7.5
Hearing problems	1	2.5

The most common postinjury symptoms reported were headache, dizziness, balance problems, visual problems, arm or leg

weakness, coordination problems, and memory problems.

The overwhelming majority of the subjects in this study had been assigned a Glasgow Coma Scale score of 15. Only two subjects were given a GCS score of 14 on the first neurological assessment performed within one hour of admission to the health care system and no subjects received a GCS score of 13. With regard to level of consciousness and neurological function following the mild TBI, the study sample was homogeneous. This pattern was consistent with the reported GCS scores of the potential population of 290 persons. That is, all but 14 potential participants (4.8%) were assigned GCS scores of 15. Of the 14 potential participants scoring less than 15, 13 persons (93%) were assigned a GCS score of 14 and one person scored 13 points on the coma scale.

Mechanism of injury was identified, where possible, from the emergency room record. Motor vehicle accidents were the most common cause of injury (n = 16) followed by bumps to the head (n = 7), falls (n = 4), alledged assaults (n = 2), and bicycle accidents (n = 2). For the remaining nine subjects mechanism of injury was not reported.

The demographic characteristics of the sample obtained in this study were interesting in light of the demographic profile of the typical head injured individual. The typical head injured individual is characterized as a male between the ages of 15 and 24 years who has been involved in a motor

vehicle accident and has sustained a concussion. These individuals generally have not completed high school. Substance abuse, risk taking behavior, and borderline personality profiles are common in this population.

The subjects in this sample were somewhat older (M = 27.7 years) and more highly educated (M = 13.15 years) than the typical head injured individual. Males and females were almost equally represented in the sample and motor vehicle accident was the most common mechanism of injury. Since substance abuse, behavioral characteristics, and personality profiles of the subjects were not obtained, no further comparisons with the typically head injured population was possible.

The age distribution of this sample was similar to that of Rimel et al. (1981). Other investigators often failed to report the demographic characteristics of their samples with respect to mean age as well as other characteristics such as sex, education, and employment. The difference between the demographic profile of this sample and that of the typical head injured individual may reflect an incomplete epidemiologic profile of the head injured population. The paucity of information relative to mild head injury could skew the data to reflect the profile of the more severely injured individual. If this skewing affects the data base upon which resources are allocated then ample attention to the problem of mild head injury may be lacking. It is

possible that the exclusion of individuals under the age of 18 years from the study sample might have resulted in a higher than expected mean age. However, individuals over the age of 40 years were also excluded; therefore, it is equally possible that the mean age of 27.7 years is lower than that of the typical individual who has sustained a mild TBI. In order for a more complete epidemiologic profile of the person who has suffered a mild TBI to emerge, investigators need to describe their sample more fully with respect to demographic characteristics and the epidemiology of mild TBI should be investigated.

The Research Questions

In this section, the data relative to each research question are presented and discussed as they appeared in Chapter 1.

Research Question 1

The first research question was concerned with describing the self-concept of persons who had sustained a mild TBI at the expected endpoint of maximum recovery of function. Self-concept was described utilizing the framework of Rosenberg (1979). The data reflective of self-concept are presented in Table 2.

The sample of mild TBI individuals had positive, stable self-concepts as evidenced by moderately high to high self-esteem scores, moderate stability of self scores and

Table 2

Self-Concept Following Mild Traumatic Brain Injury

Self-concept measure	M	SD	Range	Theoretical meaning
Self-esteem	18.60	3.88	10 - 29	Moderate to high
Self-consistency	9.15	1.92	6 - 13	Moderate
Self-consciousness	11.95	2.32	8 - 18	Low to moderate

moderately low to low self-consciousness scores. As a result of this finding it was evident that individuals who had sustained a mild TBI were not characterized by low self-concept at the expected endpoint of maximum recovery of function.

The findings with respect to self-concept were interesting in light of the research that had been reported on self-concept following injuries or illnesses. As was consistent with the reports by Anderson (1982) in her study of female adolescents with scoliosis and Penman et al. (1986) in their study of mastectomy after breast cancer, self-concept was positive and stable following mild TBI. These findings conflicted however with the results of other studies that reported negative or changing self-concepts following injuries or illnesses (Armentrout, 1979; Brinkman & Hoskins,

1979; Green et al., 1984; Litman, 1962; Newton & Johnson, 1985; Tyerman & Humphrey, 1984). It is important to note that in several of these studies it was reported that self-concept improved with rehabilitation and the recovery of maximum potential (Brinkman & Hoskins, 1979; Green et al., 1984).

The self-concept findings in this study could be reflective of the timing of the testing. If indeed maximum recovery of function had occurred by the time of testing, it is not surprising that self-concept was positive and stable. Although rehabilitative care had not been provided to the subjects in this study, subjects may have realized the return to normalcy through the disappearance of the initial symptoms associated with the mild TBI. Since the subjects felt like themselves again, their self-concepts reflected this preinjury self.

Alternatively, mild TBI may not affect self-concept. It is possible that the transient nature of neurologic dysfunction associated with mild TBI does not affect self-concept. Self-concept, as a stable personality trait, may not be influenced by transient alterations in physical or psychological function. Thus, the self-concept scores may have reflected the unaltered preinjury self-concept of the subjects.

In order to ascertain the relationship among the self-concept measures, correlational coefficients using the

Pearson Product Moment test were obtained. The coefficients are reported in Table 3.

Table 3

Correlations Among Self-Concept Measures

Self-concept measures	r	p
Self-esteem with self-consistency	.631	<.001
Self-esteem with self-consciousness	.498	<.001
Self-consistency with self-consciousness	.448	<.002

The moderately strong, positive correlation between self-esteem and self-consistency was consistent with Rosenberg's (1979) formulation of self-concept. These two self-concept motives act together to maintain and enhance the self-concept. The positive, stable self-concept found in this study may be the result of the influence of these two self-concept motives acting in consort on the structure of the self-concept. That is, it is possible that the protective nature of these motives acted to support the preinjury self-concept regardless of contrary evidence of altered functioning.

An alternative theoretically derived explanation for the positive, stable self-concept is found in examining the

structure of the self-concept. It is possible that the nature of the data collection procedure influenced the report of self-concept such that the presenting self was measured. The presenting self is the fluid, dynamic self that is presented in interaction with others. Impression management is used by the presenting self to convey a desired image. In completing the self-concept instruments, study participants may have responded in a manner that promoted a favorable image. Thus, the responses reflected the image the subject wanted to convey rather than the extant self-concept--the individual's view of the self.

Another possible explanation derived from the self-concept structure is found in examining the desired self-concept. Subjects may have responded to the self-concept measures as they wished they were or hoped to be in the future. This type of response was tested in the Tyerman and Humphrey (1984) study of self-concept in severely brain injured individuals. The subjects in that study were instructed to rate, among other things, Past Self, Present Self, and Future Self on a semantic differential used to measure self-concept. The investigators found no statistically significant difference between Past Self and Future Self indicating the expectation of these severely brain injured individuals to return to normal at some point after the injury. It is possible that in responding to the self-concept instruments, study subjects ignored any current

perception of the self and responded as they wished they were based on their memory of what they were before the injury.

The positive correlation between each of the self-concept motives and self-consciousness is consistent with the scoring method of the study instruments. In scoring the self-esteem and stability of self scales, low numerical scores are reflective of high theoretical meanings; a low score on the RSES and SSS (meaning high self-esteem and high self-consistency) should be associated with a low numerical score on the SCS (meaning low self-consciousness). Thus, the numerical correlations should be positive while the theoretical relationships are inverse. Rosenberg expressed the view that self-concept is not salient in the healthy individual. Therefore, high self-esteem and high self-consistency should be associated with low self-consciousness. This position, that 'healthy' means high self-esteem and high self-consistency, is consistent with the theory. The relationships between the self-concept motives and self-consciousness are of moderate strength.

Several explanations have been suggested to account for the positive, stable self-concept found in the individual who has sustained a mild TBI. Further investigation is needed to elucidate the determinants of this finding. These investigations need to concentrate not only on the theoretical fit between the findings and self-concept but also on the nature of mild TBI and its relationship to self-

concept.

Research Question 2

The second research question was designed to describe the relationship between the severity of the mild TBI as measured by the Glasgow Coma Scale and self-concept. The lack of variance in the admission GCS scores of the study sample created an homogenous group on the variable of injury severity. Of the 40 study subjects, 38 subjects or 95% of the sample received an admission GCS score of 15. Due to the lack of variance in the study sample on the injury severity variable, no relationships could be ascertained between the variables under consideration.

The lack of injury severity variance within the category of mild TBI provided valuable information with regard to the epidemiology of TBI. In this sample of mild TBI individuals, the overwhelming majority of patients had no alteration in level of consciousness on admission to the health care system. This lack of variance may be reflective of the true nature of mild TBI. That is, most individuals who sustain mild TBI may not experience an alteration in level of consciousness.

In a recent study reported by Dacey et al. (1986), 87.4% of 610 minor head injury patients had GCS scores of 15 within one hour of emergency room admission. Of the remaining patients, 9.7% of patients received GCS scores of 14 and 2.9% of patients were initially scored as GCS 13. All patients in

this study were admitted to hospital for observation following the minor head injury. The reported distribution of GCS scores in this study was skewed toward normal level of consciousness. This skewing was consistent with GCS scores in the present study. However, Rimel at al. (1981) reported reasonable variance in mild TBI severity using the GCS in their study--33% of the patients had admission scores of 13, 50% of the patients were initially given a score of 14, and the remaining 17% of the patients were GCS score of 15. All of these patients were admitted to the hospital for observation periods not extending beyond 48 hours and at least 43% of the patients in this study had elevated blood alcohol concentrations. It is possible that their criteria of hospital admission eliminated that population of mild TBI patients who are sent home for close observation by family or friends and that the blood alcohol was responsible for some of the reported alterations in level of consciousness.

It is possible that the determination of injury severity by the admission GCS score was an insensitive measure of injury severity either due to the timing of severity classification or the neurologic functions tested. That is, if mild TBI is a transient alteration in neurologic function, it is reasonable to suggest that by the time the patient is evaluated by a physician or nurse in an emergency care facility normal consciousness has returned. In responding to the open-ended research question, one participant commented

on the emergency room waiting time. It is possible that health care system induced delays may have influenced scoring. The nature of the scoring procedure for the GCS reduces the likelihood of a system induced explanation. A GCS score of 14 would have indicated the absence of spontaneous eye opening or the inability to obey a motor command or confused conversation. The presence of any one of these neurological deficits, if identified, generally results in prompt emergency room evaluation.

Since the GCS is designed as a measure of level of consciousness other neurological functions are not evaluated for normalcy. Mild TBI patients may have other neurological deficits that could influence functioning; the omission of these functions from GCS scoring may result in neurological homogeneity when subtle alterations in neurological functioning may indeed be present. If this is the case, measures to classify injury severity based on parameters other than level of consciousness need to be developed.

Research Question 3

The third research question was designed to determine the relationship between neuropsychological function at the expected endpoint of maximum recovery of function and self-concept. Data analysis involved the determination of measures of frequency, central tendency, and variability for each separate measure of neuropsychological function. Correlational coefficients, using the Pearson Product Moment

procedure, were obtained by correlating each separate measure of self-concept against each measure of neuropsychological function.

Neuropsychological function. The descriptive statistics obtained on the measures of neuropsychological function in this sample are presented in Table 4.

As is illustrated in Table 4, the participants in this study had normal recall as measured by the Digit Span subtest of the WAIS-R. Both digits forward and digits backward spans fell above the cutoffs for abnormal performance described by Lezak (1983). This finding indicated that for this sample of patients, the memory functions of registration and immediate memory were intact and that mild TBI did not interfere with these intellectual functions.

The mean percentile score for this sample on Parts A and B of the Trail Making Test were 69.38 and 63.13 respectively. The Trail Making Test measured the intellectual functions of attention, visuomotor tracking, and motor speed. The above 50th percentile average performance of the study subjects on this test indicated that these intellectual functions were normal following mild TBI.

Memory, as measured by the California Verbal Learning Test, was slightly impaired following mild TBI. The specific memory function that was impaired was recall as measured by the list A recall trials. The mean score for the fifth trial was almost one and one-half standard deviations below normal.

Table 4

Descriptive Statistics for Measures of Neuropsychological Function

Measure	M	SD	Range
Digit span	10.33	2.57	6 - 16
Digits forward	6.78	1.17	5 - 9
Digits backward	5.40	1.37	3 - 8
Trail making test - Part A	69.38	24.18	10 - 90
- Part B	63.13	26.84	10 - 90
CVLT - List A	43.83	13.64	22 - 68
- List A, trial 1	-0.58	0.93	-3 - +1
- List A, trial 5	-1.40	1.66	-5 - +1
- List B	-0.38	1.00	-4 - +1
- Short delay, free recall (A)	-0.93	1.44	-5 - +2
- Short delay, cued recall (A)	-0.83	1.34	-4 - +1
- Long delay, free recall (A)	-0.80	1.34	-4 - +1
- Long delay, cued recall (A)	-0.90	1.34	-4 - +2
- Perseverations	-0.90	0.63	-2 - +1
- Intrusions, free recall	0.00	0.68	-1 - +2
- Intrusions, cued recall	-0.38	1.08	-1 - +3
- Recognition	-0.86	1.48	-5 - +1
- Discriminability	-0.33	0.53	-2 - 0
- False positives	0.23	0.48	0 - +2
- Response bias	0.00	0.91	-2 - +2
Pasat @	3.41	0.86	1.97-5.27

@ One subject dropped due to unacceptable error proportion.

In all other recall measures, the mean of the study sample was below the normed mean. These recall impairments were indicative of a problem with short-term memory. Memory scores were also obtained with respect to recall errors and recognition measures. Inspection of the descriptive statistics obtained for these measures demonstrated mean performance scores that were within one standard deviation of the mean score of the normal population. These scores indicated that the rate of perseverative responses and incorrect responses (intrusions) were within normal limits. In addition, the response tendency was neutral and overall recognition performance was normal.

The slightly impaired performance on the recall measures of the CVLT is interesting in view of the normal performance on the Digit Span subtest of the WAIS-R. Both tests challenge similar memory functions of the intellect. Some possible explanations for the performance differences are found in the nature and directions for each test.

Digit span requires the individual to remember numbers while the CVLT tests memory for words. It is possible that the nature of the material to be remembered--words versus numbers--influenced memory function in these patients. During test administration it was noted that several subjects commented on their preferences for remembering either words or numbers and explained their performance based on this preference.

Additionally, the maximum number of digits to be recalled in digit span testing is nine while the CVLT requires that 16 words be remembered. With digit span testing, the number of items to be remembered is gradually increased, however all 16 words are presented in each trial of the CVLT. The gradual increase in digits presented over trials coupled with the lower maximum number of items to be recalled could have facilitated normal performance on digit span testing.

Lastly, the directions for each test could have prompted the use of different strategies for remembering (D. Guare, personal communication, May 4, 1989). In administering the Digit Span test the subject is told to repeat the numbers back in a specific fashion--either in the same order or the reverse order of presentation. The directions for the CVLT require only that as many words as possible be repeated; the order of presentation does not matter for the purpose of determining recall. It is conceivable that the directions for digit span testing provided an organizing framework that promoted recall. The absence of such an imposed structure for the recall of words on the CVLT required the subjects to invoke their own organizing framework on the task. Perhaps it is the absence of an imposed framework to structure recall that influenced performance on the CVLT. If this is the case, than memory problems following mild TBI may be the result of an inability to structure incoming material to

facilitate short-term remembering.

The last test of neuropsychological function was a measure of concentration that required the subject to attend, track, and process information at varying interstimulus intervals. PASAT performance was almost one standard deviation below normal in this sample. When scoring the PASAT, the score of one subject was dropped as a result of an unacceptably high error proportion. An additional six subjects had trial times that varied by more than 0.6 seconds across all trials. In order to assess the effect of averaging the times across all four trials for these six subjects and entering a PASAT score for each subject in the data analysis against the mean PASAT time of the rest of the sample, a t-test was performed. The t-test compared the mean PASAT score of these six subjects ($\underline{m}$ = 4.02) with the mean PASAT score of the rest of the sample ($\underline{m}$ = 3.29). Since no statistically significant difference was demonstrated between these two groups ($\underline{t}$ = 3.24, $\underline{p}$ = 0.19), PASAT scores were entered for each of these six subjects.

The borderline performance on the PASAT was not surprising in view of the acknowledged sensitivity of this test to altered intellectual function following mild head injuries. The intellectually demanding nature of this test often times results in abnormal PASAT performance when all other neuropsychological and neurological indices have returned to normal. Since this sample was tested at the

expected endpoint of return of maximum recovery of function, the findings invite questioning of the time periods currently cited for full return to premorbid functioning. It may be that for many people full recovery does not return by three months following a mild TBI. If full recovery is delayed it is important that tests, like the PASAT, be administered until return to normal intellectual functioning is demonstrated. As is advised by Ruff et al. (1986) activities such as "taking examinations, completing negotiations on a business contract, processing detailed information from conversations, or concentrating while driving..." may require special precautions and assistance until full recovery of intellectual abilities is realized (p. 49).

Neuropsychological function and self-concept. In order to ascertain the relationship between neuropsychological outcome at the expected endpoint of maximum recovery of function and self-concept correlational coefficients were obtained using the Pearson Product Moment procedure. The statistically significant relationships are summarized in Table 5. In this sample, age and gender were not found to be related to neuropsychological function.

The only measure of neuropsychological outcome that was related to self-esteem was the PASAT score. The relationship between the PASAT score and self-esteem was moderately weak and positive indicating a tendency for people with high self-esteem to have high intellectual functioning as measured by

Table 5

Neuropsychological Outcome and Self-Concept

Variables	r	p
Self-esteem with		
PASAT	.31	.026
Self-consistency with		
Digit span	-.27	.043
Digits forward	-.30	.028
Digits backward	-.27	.043
PASAT	.40	.006
Self-consciousness with		
Trails B	-.29	.037
California verbal learning test		
list A	-.35	.013
list A, trial 1	-.29	.036
list A, trial 5	-.42	.003
short delay free recall	-.28	.038
long delay free recall	-.32	.023

the PASAT. Since the PASAT provides a measure of attention, concentration, and rate of information processing, this means that the ability to attend, concentrate, and rapidly process information in this sample of mild TBI patients is associated

with high self-esteem. This means that those subjects that had recovered (or never lost) normal neuropsychological function as evidenced by their PASAT score had higher self-esteem as measured by the RSES. Alternatively, it is possible that higher intellectual ability resulted in better PASAT performance which was then associated with higher self-esteem. This hypothesis could not be tested due to the nonreporting of high school GPA and noncomparability of reported class ranks on high school transcripts. In contemplating this hypothesis it is important to remember that Gronwall and Wrightson (1974) reported that general intelligence is not significantly related to PASAT performance.

While not surprising, the identified relationship between PASAT performance and self-esteem is important. As reported earlier in this chapter, self-concept following mild TBI is positive and stable. Yet, variation in self-concept is found following mild TBI. One way to predict those patients who are more apt to have self-concept problems is to administer the PASAT. Poor PASAT performance could be a predictor of potential problems with self-concept. Since problems associated with the self-concept are important areas of nursing concern, the nurse would be alerted to assess for other indicators of a problem with self-concept and intervene as warranted.

Self-consistency scores were found to correlate with

four measures of neuropsychological outcome. All three Digit Span scores were negatively correlated with self-consistency. The coefficients represented weak to moderate relationships. As with self-esteem, the PASAT score had a moderate, positive correlation with the measure of self-consistency. In interpreting these results, it is important to remember that high scores on the Digit Span measures were indicative of intact memory, low scores on the PASAT signified intact information processing ability, and low scores on the SSS reflected stable self-concept. These correlations indicated that those subjects who had normal intellectual functioning as evidenced by intact immediate memory and information processing skills had higher levels of self-consistency or a more stable self-concept. However, the inability to obtain measures of premorbid self-concept stability and neuropsychological function meant that premorbid status was not known. It is therefore also possible that these measures were constant across the injury and postinjury period.

The identified relationships between self-consistency and neuropsychological function are predictable from Rosenberg's description of self-concept. And, they provide useful information for the nurse in caring for patients who have sustained a mild head injury. Performance on the Digit Span subtest of the WAIS-R could, to a certain extent, facilitate the prediction of those patients who may experience uncertainty about the self. Since uncertainty

about the self is associated with the potential for a disturbance in self-concept, the nurse would have an objective means to identify patients at risk for self-concept disturbances. In addition, educational interventions aimed at supporting the self-concept through increasing the awareness of common, albeit temporary, intellectual deficits associated with mild TBI could facilitate patient coping by providing patients with a referent for their self-observations.

The ease with which the Digit Span is administered makes it an ideal test for emergency room or office assessment of immediate memory. Incorporating this type of test into the assessment of the head injured individual would facilitate a more comprehensive assessment of the effect of the mild TBI on the individual--at least at the point where recovery of function is anticipated to have occurred.

Because of its stronger relationship with self-consistency, and its relationship with self-esteem, performance on the PASAT would provide a more predictable picture of the effect of mild TBI on self-concept. PASAT scores are similarly related to self-esteem and self-consistency, the two motives that drive the self-concept. Therefore, performance on the PASAT could be used to more accurately identify patients at risk for alterations in self-concept following mild TBI. Although the PASAT requires more time and equipment to administer and score, it is possible

that these disadvantages are outweighed by the advantage of identifying and intervening before at-risk patients develop secondary adjustment problems from the neuropsychological sequelae of their mild TBI.

The last measure of self-concept, self-consciousness, was found to have statistically significant relationships with Part B of the Trail Making Test and with the total recall score and several recall subscores of the CVLT. The relationship between the Trail Making Test, part B and self-consciousness was weak and inverse. This relationship indicated that subjects who completed Part B quickly had lower self-consciousness scores. Since Part B measured attention, visual conceptual and visuomotor tracking, and motor speed, low Part B times (scores in the higher percentiles) indicated that these intellectual functions were intact.

The total recall score (list A) as well as the list A, trial 1 and trial 5 and short and long delay free recall scores of the CVLT provided an overview of recall as part of memory functioning. These scores demonstrated moderate to moderately weak inverse relationships with self-consciousness as measured by the SCS. These relationships meant that high standard scores on the CVLT, indicative of intact recall and short-term memory functions, were associated with low self-consciousness.

The relationships between the above measures of

neuropsychological function and self-consciousness were consistent with Rosenberg's formulation of self-concept. It was not surprising that intact intellectual functioning was associated with a healthy self-concept as evidenced by low self-consciousness at the point of maximum recovery of function. Intact intellectual function would, most likely, not be salient to the fully recovered individual. Thus, this individual would not be concerned with poor memory functions or difficulties of attention, tracking, and motor speed because these problems would not exist. As a result, self-consciousness would be low.

The inverse relationships demonstrated between self-consciousness and measures reflective of memory and attention and tracking provide the nurse with a potential method to predict which mild head injury patients are at risk for alterations in self-concept. As previously discussed, administration and interpretation of tests designed to measure the intellectual functions that are associated with self-consciousness provide valuable information regarding the at-risk patient. Patients who perform poorly on measures of word recall, such as the CVLT, or on motor tasks that require attention and visuomotor skills are potentially vulnerable to a heightened awareness of self. This attention to the self could lead to secondary adjustment difficulties, emotional problems, and social withdrawal. Since the goal of the nurse is to diagnose and treat the responses to the health problems

created by the mild TBI, rapid identification of the patient at risk for an abnormal response is critical to the timely implementation of nursing interventions to minimize unhealthy responses.

Although overall measures of self-concept and neuropsychological function were not utilized in this study, the relationships identified between the measures reflective of self-concept and the measures reflective of intellect were consistent. The positive (high self-esteem), stable (high self-consistency), non-salient (low self-consciousness) self-concept was associated with intact neuropsychological functioning. Intact functioning was reflected by low PASAT performance times; longer digit spans; higher Trail Making Test, Part B percentile scores; and higher recall scores on the CVLT. The individual with this neuropsychological profile demonstrated normal attention, concentration, memory, tracking, and information processing abilities.

The relationships that were found between measures of neuropsychological function and measures of self-concept provide a method for nurses to assess the possibility that a patient with a mild TBI is at risk for disturbances in self-concept. If, at the expected time of full recovery of function, impaired performances are noted in intellectual functions then the potential for a negative, unstable, and/or salient self-concept exists. Appropriate interventions, including further assessment, education, and referral should

be implemented to minimize this undesired response to the aftermath of mild TBI. Through these interventions, the secondary consequences of poor adjustment will be minimized and the patient will more rapidly regain maximum achievable health.

Content Analysis of Open-Ended Question

One of the goals of this study was to identify additional areas of concern that patients may have following a mild TBI. In order to gather information regarding concerns relative to changes in feelings and abilities following mild head injury, participants were asked the following question: "Have their been any changes in the way you feel or in your abilities since your head injury that you think it is important for nurses to know about?". Responses to this question were recorded in paraphrased format by the investigator.

Of the 40 study subjects, 17 subjects (42.5% of the sample) responded no to the question. The responses of the remaining 23 subjects were analyzed by the investigator to identify the major response themes. The major response themes fell into five categories. These categories were time limited residual symptoms, ongoing residual symptoms, unmet educational needs, provider related problems, and impact on life style.

Time limited residual symptoms were reported by eight

subjects. These symptoms included physical and intellectual problems that persisted for a limited time following the mild TBI and resolved spontaneously. Examples of these symptoms included headaches, weakness, visual blurring, problems with hearing and balance, and feeling "floaty". The most common problem identified by respondents in this category was persistent headache. These findings were consistent with the results of minor head injury studies conducted by Coonley-Hoganson, Sachs, Desai, and Whitman (1984); Levin, et al. (1987); Rimel, et al. (1981); Wrightson and Gronwall (1981); Rutherford, Merrett, and McDonald (1979), and the report of Binder (1986) as well as many others. In relating time limited residual symptoms, study participants seemed to be reporting information they thought nurses should know about. Most commented that they did not expect the symptoms to be as bad as they were or last as long as they did.

The largest number of responses were classified as ongoing residual symptoms. These were problems that the subjects attributed to the mild head injury that have seemingly affected their abilities and/or feelings. The ongoing symptoms were physical, intellectual, and emotional in nature. Nine subjects noted a variety of problems such as persistent headaches, depression, feeling scared and foolish, self-doubt, paranoia, difficulty coping, memory problems, shorter tempers, fatigue, coordination problems, problems with visual focusing, sleep changes, decreased appetite, easy

frustration, and decreased patience.

In reporting these symptoms, participants often identified their strategy to deal with the problems created by these symptoms. For example, in reporting a series of emotional problems related to the head injury, one respondent stated that "I take Valium to keep the edge off" and "I have isolated myself from others to avoid embarrassment". Another subject was "more cautious" and found exercise helpful in relieving tension. One subject stated the need to review or reread in order to remember simple things. Several subjects noted some improvement with these problems over time.

Unmet educational needs were identified in the responses of three subjects. These needs were for more information about the occurrence of residual symptoms, the severity of the problems, and the need to take it easy for a few days after the injury. As with time limited residual symptoms, these responses seemed to be targeted to information that nurses should know about the sequelae of mild TBI.

The five responses in the category of provider related problems were highly individualized. These responses appeared to reflect a need to inform nurses about problems in the system that required attention. For example, one subject mentioned the long waiting time in the emergency room. A subject who had been hospitalized for the mild TBI stated that "as you get better nurses...should not withdraw contact". Other subjects commented on the paternalism of

health care providers and on the need for providers who become patients to "receive the same treatment anyone else would get".

The final major theme was the impact of the head injury on lifestyle. The responses in this category seemed to reflect changes in the way subjects felt following the head injury and how those feelings affected their lives. The three responses in this category described lifestyle changes subjects either were considering or had already implemented. As examples, one subject "wears a seatbelt now" while another subject was in the process of job reconsideration. A subject who had experienced a prior head injury stated the injury made "a positive impact on my life...I'm more careful".

Content analysis of the responses to the open-ended question did reveal five areas of concern about which participants believed nurses should be knowledgeable. These areas were time limited residual symptoms, ongoing residual symptoms, unmet educational needs, provider related problems, and changes in lifestyle. Each of these areas needs to be explored in more detail through appropriate research investigations to identify the extent and impact of each concern on the patient following mild TBI and to enhance nursing knowledge regarding the experience of head injury for the individual person.

Summary

The sample for this study was comprised of 40 subjects who had sustained a mild TBI and agreed to participate in the study. The analysis of the data obtained from these subjects indicated the following:

1. Self-concept following mild TBI was positive and stable at the expected endpoint of maximum recovery of function. At that time, self-concept was not salient for the person who had sustained the mild TBI.

2. Little variability in the severity of a mild TBI was noted in the sample. The lack of variability limited the planned data analysis and called into question the true nature of mild TBI with regard to altered neurological function and/or the measures utilized to classify head injuries as mild.

3. Mild impairment in neuropsychological function was present at the expected endpoint of maximum recovery of function. These impairments were most evident in the realm of recall, short-term memory, concentration, and information processing.

4. Self-concept was weakly to moderately associated with neuropsychological outcome at the expected endpoint of maximum recovery of function. Normal performance on measures of neuropsychological function was associated with high self-esteem, high self-consistency, and low self-consciousness. These relationships were consistent with the theoretical

explanation of self-concept as posited by Rosenberg (1979).

5. Performance on neuropsychological tests can be used to enhance the identification of the person with a mild TBI who is at-risk for disturbances in self-concept at the expected endpoint of maximum recovery of function. The incorporation of easily administered, scored, and interpreted intellectual tests into the nursing assessment of the mild TBI patient should be encouraged.

6. The study participants believed nurses should have knowledge of time limited residual symptoms, ongoing residual symptoms, unmet educational needs, provider related problems, and life-style changes that are experienced following a mild TBI. These five areas should be targeted for further research not only to improve the nursing care delivered to patients who have experienced a mild TBI, but also to increase nursing knowledge about human responses to mild TBI.

C H A P T E R V

Summary, Conclusions, and Recommendations

This chapter begins with a summary of the purpose, methods, and findings of the present study. Conclusions regarding the findings are presented. Finally, recommendations specific to nursing practice, nursing theory, and further research are described.

Summary

The purpose of this study was to describe self-concept following a mild traumatic brain injury at the expected endpoint of maximum recovery of function. According to the literature, this endpoint occurs between six and twelve weeks after injury. Additionally, the study was designed to identify any relationships among self-concept, injury severity, and neuropsychological outcome. It was believed that the description and identification of factors associated with self-concept would enhance nursing's knowledge regarding the experience of mild TBI and the nursing diagnosis `disturbance in self-concept'.

Rosenberg's framework was used to investigate self-concept. Rosenberg describes self-concept as a tripartite structure that is developed, maintained, and enhanced by self-concept motives and principles. Self-concept is operationalized by measuring self-esteem and self-

consistency. Additionally, self-consciousness is measured to determine the salience of the self. According to the theory, a healthy self-concept is revealed by high self-esteem, high self-consistency, and low self-consciousness.

The sample for this descriptive study was comprised of 40 subjects aged 18 to 40 years who were assigned Glasgow Coma Scale scores between 13 and 15 within one hour of admission to the emergency department, met all inclusion criteria, agreed to participate, and completed all instruments. Subjects completed the demographic data sheet, Rosenberg Self-Esteem Scale, Stability of Self Scale, Self-Consciousness Scale, Digit Span Test, Trail Making Test, California Verbal Learning Test, and Paced Auditory Serial Addition Test. They also responded to a question regarding changes following TBI that nurses should know about. Data were analyzed using descriptive and correlational statistics and content analysis.

The study's findings indicated that self-concept was positive and stable at the expected endpoint of maximum recovery of function following mild TBI. Self-concept was weakly to moderately associated with neuropsychological outcome. Subjects who had normal neuropsychological function were more likely to have higher self-concepts than subjects with impaired neuropsychological function. Several themes emerged regarding changes following TBI that nurses should know about including residual symptoms, educational needs,

and provider related problems.

Conclusions

The purpose of this study was to describe self-concept following mild TBI and to identify any relationships that existed between injury severity and self-concept and neuropsychological outcome and self-concept. The conclusions of this study, based on the findings of the investigation, are presented in this section.

First, self-concept following mild traumatic brain injury was positive and stable at the expected endpoint of maximum recovery of function. By six to twelve weeks following their mild TBI, individuals reported high levels of self-esteem, high levels of self-consistency, and low levels of self-consciousness. It is not known whether these findings represent a recovery of self-concept following alterations associated with the injury or whether self-concept is not affected by mild TBI. Further investigation is required to resolve this question.

Second, Rosenberg's description of self-concept provided an appropriate theoretical framework to investigate self-concept following mild TBI. Self-concept can be described with regard to self-esteem, self-consistency, and self-consciousness. Self-concept descriptions were consistent with theoretical predictions based upon the relationship of the self-concept motives and self-consciousness to self-

concept. The global nature of the directions for responding to the self-concept instruments may need to be adapted for longitudinal studies of self-concept following mild TBI. That is, the directions may need to be modified to ask the individual to respond to the instrument's statements since their head injury or since the last time the questionnaire was completed.

Third, while the Glasgow Coma Scale provides a mechanism to quantify injury severity, within the range of mild injuries the scale may not be as sensitive as is needed to subclassify mild injuries. The difficulties identified with the use of reports of length of loss of consciousness and tests of length of posttraumatic amnesia are acknowledged. However, it may be necessary to use some combination of these standard measures or develop new measures to subclassify injuries within the range termed mild or minor.

Fourth. the epidemiology of traumatic brain injuries is incomplete. Previous descriptions of the typical head injured person are clearly derived from studies of individuals who were hospitalized following more severe injuries. Studies are needed to identify the individual at risk for mild head injury and the physical, psychological, and social factors associated with mild injuries.

Fifth, while many persons may have normal neuropsychological function by six to twelve weeks following mild TBI, there are individuals who continue to demonstrate

impaired memory performance, impaired information processing abilities, and poor concentration. Programs need to be developed to identify persons at-risk for altered neuropsychological function. As a beginning step, all persons who have sustained a mild TBI should be educated as to the possibility of impaired intellect, the symptoms to watch for, and when to seek outside help.

Sixth, it is possible for nurses to investigate neuropsychological function with respect to intellect using a short battery of highly valid and reliable tests. The tests are easy to administer, and with appropriate continuing education, nurses can interpret the tests for the purposes of referral to other health care providers. Thorough test interpretation requires the additional consideration of premorbid intellectual, academic, and personality factors. Definitive diagnosis and treatment of neuropsychological disorders must be done by health care professionals who are qualified to render such a diagnosis.

The costs of continuing education need to be considered when implementing neuropsychological assessment by nurses. These costs include actual time in class, time for test administration and scoring, and time in patient education relative to test findings. Neuropsychological assessment by nurses is recommended by Warren, Goethe, and Peck (1984). The instruments they describe are for use by nurses during a patient's hospitalization for the purposes of data trending

over time. Instruments for use in emergency room settings would differ in focus and emphasize single scores measured against accepted norms. In implementing neuropsychological assessment consideration should be given to selecting tests that can be taught, administered and scored, and interpreted in a cost effective fashion. At a minimum, forms nurses use to assess neurological function should incorporate elements of intellect testing to screen for the existence of impaired function. Early detection of impairments, leading to early intervention, could result in better adjustment to impairments with fewer days lost to work, less social morbidity, and quicker return to maximum function.

Seventh, impaired performance on tests of neuropsychological function following mild TBI may indicate low or unstable self-concept. Whether this relationship is global--that is, all persons with impaired intellect have low self-concept--or specific to mild TBI is unknown. Further investigation is required to more fully describe this relationship. In the interim, nurses should be cognizant of the possible relationship of impaired intellect to low self-concept following mild TBI and assess for the indicators of disturbances in self-concept to identify, diagnose, and intervene where warranted.

Lastly, it is useful to provide a mechanism for patients to identify concerns following an injury that nurses should be aware of. The use of an open-ended question allows the

patient to identify those problems or concerns that are significant to the individual. Analysis of the responses to such questions provides for the identification of response themes that can expand nursing knowledge, identify gaps in nursing care, suggest areas for further research, and enhance understanding of the human response to health problems.

Recommendations

Based on the findings and conclusions of the present study, the following recommendations for nursing practice, nursing theory, and further research are made.

Nursing Practice

Nurses practicing in settings where individuals who have sustained mild TBI are seen need to be aware of the neuropsychological sequelae of mild TBI. These sequelae include the possibility of impaired short-term memory performance, impaired information processing ability, and poor concentration. Assessment techniques that screen for the presence of these deficits should be incorporated into the neurological examination of these patients. Educational interventions that inform the patient of the potential appearance of these symptoms should be added to discharge instructions given to patients following head injury. Since short-term memory impairments may occur following mild TBI, nurses are advised to include a family member, roommate, coworker, or friend in discharge teaching. These individuals

should be taught not only the immediate signs of increased intracranial pressure, but also the signs of altered neuropsychological function and the time course that symptom resolution may follow. Patients, and other individuals included in discharge teaching, should be advised when to seek additional follow-up health care should symptoms occur.

Discharge instructions related to physical sequelae following mild TBI need to reflect the variable length of time that symptoms may be experienced after the injury. Study participants reported surprise at the severity of the postinjury symptoms and that symptoms persisted beyond one to two days following injury. In fact, the greatest number of responses to the question regarding changes since the head injury were reports of ongoing residual symptoms. Since study participants were not interviewed until, at a minimum, six weeks following the injury reported symptoms had been ongoing for at least six weeks. The nature of these ongoing symptoms were physical, intellectual, and emotional. Some participants identified coping strategies they had utilized to lessen the impact of the residual symptoms on their lifestyle. While patients should be applauded for utilizing adaptive coping strategies, they should not be surprised at the need to use such strategies. It is imperative that nurses inform patients not only of possible sequelae, but also of ways to cope with symptoms should they occur. Providing patients with telephone numbers and contact persons

for follow-up questions or concerns may minimize secondary adjustment difficulties, emotional problems, or social withdrawal. Alternatively, follow-up telephone contact could be made with the patient one to two weeks after the injury to ascertain any continuing symptoms.

Individuals who demonstrate neuropsychological impairments six to twelve weeks following their mild TBI may also experience low self-concept. Nurses should assess these patients for disturbances in self-concept using the critical cues identified as defining characteristics for the nursing diagnosis 'disturbance in self-concept'. Those persons in whom a disturbance in self-concept is confirmed need the implementation of a plan of care designed to resolve this problem.

Since a small minority of study participants identified problems encountered with the health care system in receiving care following their mild TBI, nurses need to identify the factors contributing to delays in initial evaluation and problems in provider-patient relationships. It is especially important that persons who have sustained a TBI are immediately evaluated by a trained professional for level of consciousness and neurological function.

Nursing Theory

The present investigation supported the usefulness of Rosenberg's conceptualization of self-concept in studying self-concept. The findings of this study supported the

postulated relationships between the two self-concept motives--self-esteem and self-consistency--and self-concept. In addition, the inverse relationship between self-consciousness and self-concept was supported.

The instruments used to measure self-concept are easy to administer and score using the summated scoring format. The use of these instruments to assess self-concept may provide a more valid, reliable, and objective indicator of a disturbance in self-concept and lead to more precise identification of this nursing diagnosis in clinical practice. In addition, research on the validation of this particular diagnosis and its critical defining characteristics may be enhanced with the use of these measures.

All major nursing theories incorporate the individual as a concept of central concern. Fawcett (1984) views the person as one of four concepts of the metaparadigm of nursing. Therefore, thorough assessment of the individual is critical to the identification of problems amenable to nursing intervention. In spite of the importance of thorough assessment, no objective means of assessing psychosocial status, including self-concept, are available to the nurse. The incorporation of Rosenberg's description of self-concept into explanations of the development, maintenance, and enhancement of feelings and beliefs about the self may serve to fill this gap. Theoretical work needs to be directed to

the fit between Rosenberg's description and the person as a central concept in nursing theory. Further elaboration of the self-concept principles and their relationship to the self-concept motives and self-concept structure will provide knowledge critical to the understanding of self-concept and provide a means to predict persons at-risk for self-concept disturbances.

Nursing Research

Several areas for further investigation are suggested by the findings of this descriptive study. First, replicate this study using a larger sample size to determine if the findings are reproducible. A larger sample size would provide the power to perform multivariate analyses to more clearly identify factors following mild TBI that are related to self-concept.

Second, longitudinally investigate self-concept following mild TBI to determine if changes occur over time after a mild TBI. Testing could be performed at 24 hours then at two weekly intervals until scores have stabilized. Repeated testing may require modification of the instruments' directions for completion to better capture the influence of mild TBI on self-concept. Care would need to be exercised to avoid excessive attention to the self which may result in increased salience.

Third, design a similar study that incorporates the use of a control group to more clearly identify any relationship

between mild TBI and self-concept. Several investigators recommend the use of a control group drawn from the patient's relatives or friends and matched on variables such as age and education to nullify the effect of intervening variables.

Fourth, develop a means to more accurately stratify persons within the category of mild TBI on injury severity. Parameters to be considered include length of loss of consciousness, length of posttraumatic amnesia, presence of positive neurological findings, findings of diagnostic imaging studies, findings of evoked potential testing, and neuropsychological function among others. The final assessment tool should be easy to administer and interpret in the clinical situation and demonstrate high interrater reliability. This type of instrument would facilitate the research on severity of injury and patient outcome.

Fifth, conduct large scale epidemiologic studies of mild TBI to obtain a clearer picture of this injury and the characteristics associated with mild TBI. This type of information is needed to facilitate the development of preventive programs designed to reduce the incidence of mild TBI and to justly allocate resources for the treatment of mild TBI.

Sixth, design a study to test the impact of educational information on neuropsychological sequelae and residual symptoms following mild TBI. An experimental approach could be utilized to measure symptom reporting, satisfaction with

care, and secondary adjustment problems. The value of patient preparation as opposed to concerns over suggesting problems could be determined by this approach.

Seventh, test the usefulness of the self-concept measures as indicators for the nursing diagnosis `disturbance in self-concept'. Comparison of scores on these measures with other objective and subjective measures of self-concept may demonstrate the validity of Rosenberg's scales as critical cues for the identification of this nursing diagnosis.

Lastly, the entire spectrum of TBI needs to be examined for the impact of the injury on the individual's sense of self. Studies need to be designed to investigate self-concept following moderate TBI as well as after severe TBI. The relationship between TBI severity and self-concept needs to be examined to more clearly elucidate the shape of any relationship that exists across the injury severity levels. And, studies that relate recovery to self-concept are needed to more clearly identify the impact of improved performance on self-concept and to assist in the identification of any association between secondary adjustment problems and disturbances in self-concept.

The suggested recommendations for nursing practice, theory, and research present a framework for the improvement of nursing care to persons who have sustained mild head trauma. In addition, continued study of Rosenberg's self-

concept theory and its application to the science and practice of nursing will expand nursing knowledge about the development, maintenance, and enhancement of self-concept. Implementation of the suggested recommendations should serve to assist the nurse in the diagnosis and treatment of the human response to illness, specifically mild traumatic brain injury.

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A P P E N D I C E S

APPENDIX A

Glasgow Coma Scale

Eye Opening		
spontaneous	4	
to verbal command	3	score _____
to pain	2	
no response	1	
Best Motor Response		
obeys command	6	
localizes	5	
withdraws	4	
abnormal flexion (decorticate)	3	score _____
abnormal extension (decerebrate)	2	
no response	1	
Best Verbal Response		
oriented and converses	5	
disoriented and converses	4	
inappropriate words	3	score _____
incomprehensible sounds	2	
no response	1	

total score _____

Appendix B

BOSTON UNIVERSITY SCHOOL OF NURSING
Doctor of Nursing Science Program
635 Commonwealth Avenue
Boston, MA 02215
[redacted]

A Study of Self-Concept Following Head Injury

INFORMED CONSENT

Following a head injury, some persons report changes in the way they feel about themselves. The purpose of this study is to describe the nature and extent of these changes, and to see if the changes are related to the severity of the head injury and the psychological outcomes following the head injury.

You will be asked to complete four questionnaires and take four tests of psychological function. The questionnaires will ask you to provide information about yourself and to indicate your agreement or disagreement with several statements. The tests of psychological function will ask you to perform several activities, such as following directions, remembering information, and simple arithmetic. In order to compare your performance on these tests with your general ability before your head injury, you will be asked to sign a release form permitting the researcher to obtain a copy of your high school transcript. You may be asked to repeat some of the tests in 6 months.

It will take approximately one and one-half hours to complete all the questionnaires and tests. There are no known risks associated with completing the questionnaires or taking the tests. Benefits, if any, that result from participating in this study are unknown at this time.

I will answer any questions you have concerning your participation in the study or any other questions about this study. You are free to withdraw your consent and discontinue participation in the study at any time. You are free to decline to answer any items or questions in the study questionnaires and tests. Your decision to volunteer or not to volunteer to participate in this study will in no way affect the care you receive related to your head injury.

The study questionnaires and tests will be identified by code number. Your name will not appear on these materials. All study results, as well as transcripts, will be kept

confidential. The questionnaires, tests, and transcripts will be kept in the researcher's home in a locked file. All study materials will be destroyed by shredding at the completion of the study.

I have read and understand the above information. I agree to participate in this study.

Date: _____

Signature: _____

Principal Investigator
Name: Kathryn R. Lynch, M.S.N.
Address: [redacted] 03801
Telephone: [redacted]

Faculty Advisor-First Reader
Name: Carole Shea, Ph.D.
Address: [redacted]
Telephone [redacted]

Appendix C

BOSTON UNIVERSITY SCHOOL OF NURSING
Doctor of Nursing Science Program
635 Commonwealth Avenue
Boston, MA 02215
[redacted]

A Study of Self-Concept Following Head Injury

Consent to Release Transcript

I, _____, hereby give permission to have one copy of my high school transcript released to:

Kathryn R. Lynch, M.S.N.
[redacted]

I graduated from _____
(name of high school)
in _____. The school is located in _____.
(year) (city, state)
My name at the time of graduation was _____.

I understand that any costs associated with the release of this transcipt will be paid by Kathyrn R. Lynch.

Date: _____
Signature: _____

Appendix D

GPA _____ Code No. _____
Rank _____ GCS score _____

A Study of Self-Concept Following Head Injury

Demographic Profile

Instructions: Check or write in the appropriate response to each of the following questions. Answer all questions.

1. Current age _____

2. Current marital status: single _____ married _____
   separated _____ divorced _____

3. Highest educational level: _____

4. Current occupation _____

5. Current employment status: employed full time _____
   employed part time _____ not employed _____

6. Current yearly income _____

7. Number of previous head injuries _____

8. When you were in school did you have any problems with:
   a. reading: no _____ yes _____ explain _____
   b. spelling: no _____ yes _____ explain _____
   c. math: no _____ yes _____ explain _____

9. Were you ever placed in special education classes:
   no _____ yes _____ explain _____

10. Did you ever repeat a grade in school: no ____ yes ____

11. Check all of the problems listed below that you are currently experiencing as a result of your head injury:

weakness in an arm or leg _____	memory problems _____
numbness in an arm or leg _____	insomnia _____
problems with vision _____	dizziness _____
problems with hearing _____	headache _____
problems with balance _____	other _____
problems with coordination _____	
problems with walking _____	

Appendix E

Code No. _____

Open-ended Question

Have there been any changes in the way you feel or in your abilities since your head injury that you think it is important for nurses to know about?

Curriculum Vitae

KATHRYN R. LYNCH
[redacted]

Education

1980	M.S.N.	University of Virginia Major: Medical-Surgical Nursing Minor: Education
1977	B.S.N.	Northeastern University Major: Nursing
1973	Diploma	Albany Medical Center School of Nursing Major: Nursing

Certification

1979	CCRN	American Association of Critical Care Nurses

Employment

1981-present	Critical Care Instructor Wentworth-Douglass Hospital Dover, NH
1981-present	Adjunct Assistant Professor of Nursing University of New Hampshire Durham, NH
1979-1981	Instructor of Nursing Louisiana State University Medical Center New Orleans, LA
1973-1979	Staff Nurse/Charge Nurse in Critical Care Ochsner Hospital, New Orleans, LA University of Virginia Hospital Charlottesville, VA New England Deaconess Hospital, Boston, MA University Hospital, Boston, MA Albany Medical Center Hospital, Albany, NY

Professional Associations

1981-present	New Hampshire Nurses' Association
1977-present	Sigma Theta Tau
1976-present	American Nurses' Association
1975-present	American Association of Critical Care Nurses