EMOTIONAL FUNCTIONING IN PEOPLE WITH TRAUMATIC BRAIN INJURIES (TBI)

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DECLARATION

I declare that this dissertation contains my own unaided work, and has not been submitted before for any degree or examination to any other university.

TCMasilela

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ABSTRACT

This study investigated the emotional functioning of people who had been diagnosed as having traumatic brain injuries (TBI) of the frontal lobes. This was done with a view to examining whether there were changes in the emotional functioning of people with TBI in the period following their injuries. The pre-injury (or premorbid) emotional functioning of the respondents with TBI was assessed retrospectively through self-reports, which were compared with the ratings by the primary and secondary care-givers of these respondents. The current (post-injury) emotional functioning of the participants with TBI was also assessed through self-reports and the ratings by the primary and secondary care-givers.

A total of 42 individuals participated in this study. Fourteen (14) of these were male subjects between the ages of 18 and 37, who had sustained their TBI at least two years before the study. The other 28 participants were the primary and secondary care-givers of the respondents with TBI, that is, people who had lived with them for at least 2 years before their injury and for at least 1 year after the injury. Structured interviews were conducted with the three groups of respondents (i.e. people with TBI, their primary care-givers and their secondary care-givers) with the aid of the Katz Social Adjustment Scale.

The main thrust of the present study was not to describe the personality structure of the individuals with TBI in line with a specific personality theory, but to assess their adjustment/emotional status following their TBI. The study was thus more concerned with malfunctioning or pathology than with enduring attributes and stylistic traits. Hence the Katz Social Adjustment Scale was used. Alexander Luria's theory of the structural and functional organisation of the brain was used to understand the malfunctioning or maladjustment that was found to be associated with TBI.

The findings of this investigation point to the fact that there are several aspects of premorbid emotional functioning that change following TBI. Changes were found to have occurred on the dimensions of emotional functioning such as: Depression/Catastrophic Reaction, Suspicion/Paranoia/Persecutory anxiety, Loneliness and Social Withdrawal and Psychiatric Symptoms. The findings also indicate that some aspects of premorbid emotional functioning remain intact after the injury. The following dimensions of emotional functioning were reported to have remained intact after TBI: Anger, Lack of Concern/Diminished Anxiety/Egocentricity and Strange Behaviour. These findings corroborate the view that changes in emotional functioning as a result of TBI are not a single unified entity, but are diverse emotional and behavioural patterns.

This study could not distinguish areas of traumatic brain injury that can be associated with particular disturbances in emotional functioning. Also, the study has not been able to single out aspects of premorbid emotional functioning that mediate the impact of TBI. The implications of these findings in terms of the current literature, and the suggestions for future research are discussed.

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CHAPTER 1

INTRODUCTION

This study seeks to assess the personality functioning of people who have been diagnosed as having traumatic brain injuries (TBI). It focuses on a specific aspect of personality, namely, the emotional functioning of individuals with TBI. The concept "TBI" refers to any assaultive injury to the head, and encompasses motor vehicle accidents, gunshot wounds, blows, and falls from a height (Burns, Kappenberg, McKenna and Wood, 1994). In this study, the term *TBI* is preferred to the term *head injury* because the former emphasizes that the brain has been damaged secondary to external forces applied to the skull and its contents (Prigatano, 1992). Brian damage resulting from alcohol use or ageing (dementia) is excluded from this study.

As a prelude to the investigation of the relationship between TBI and emotional functioning, it is essential to define the two key concepts that will be used in the study, namely personality and emotion. *Personality* is defined as "patterns of emotional and motivational responses that develop over the life of the organism; are highly influenced by early life experiences; are modifiable; but not easily changed, by behavioural or teaching methods; and greatly influence (and are influenced by) cognitive processes..." Prigatano (1992, p. 360). *Emotion,* on the other hand, is described as the "reactions to an appropriately evocative stimulus involving cognitive appraisal/perception, subjectively experienced feeling, autonomic and neural arousal, expressive behaviour, and goal-directed activity" (Plutchik , 1984, cited in Borod, 1992, p.339). Stuss, Gow and Hetherington (1992) state that the concept of emotion encompasses three concepts, namely mood, affect and drive. They define *mood* as the 'internal experience of a subjective feeling tone, *affect* as the 'external manifestations of feelings, the physical expression of mood', and *drive* as a force that energises or initiates human activities (Stuss et al., 1992, p.350).

TBI is a major problem internationally. It has been reported that TBI is one of the largest contributors to death amongst children and adolescents in the United States of America (Frankowski, 1985; Goldstein & Levin, 1987, cited in Martin, 1988). According to Kraus et al. (1987, cited in Max et al., 1998) about 100 000 children under the age of 15 are hospitalised with head injuries annually in the USA. Some authors estimate that 1 million children sustain close head injuries annually (Eiben et al., 1984, cited in Martin, 1988). As Fisher (1985, cited in Martin, 1988) points out, a large majority of this group will develop physical, intellectual, behavioural (and emotional) problems.

While there has not been a systematic documentation of the exact figures of TBI in both adults and children in South Africa, the extent of the problem is likely to be of even greater magnitude than that described in the USA. The issue of TBI is of major relevance in the South African context due to the high levels of violence engulfing the country. The post-election period in South Africa has seen a marked decline in the level of political violence, but an increase in criminal and other forms of violence. Homicides, armed robberies, car hijacking, and road accidents, are the main themes in many local newspapers. According to the *South African Institute of Race Relations (SAIRR),* South Africa had the highest incidence of violent crime among 58 countries surveyed by the World Health Organisation in 1995, with 44 murders per 100 000 people (SAIRR Report, January 1996, p. 9). The rate of motor vehicle accidents (MVAs) in this country is also alarming. According to *The Citizen (07 January 1999),* a total of 787 people were killed on South African roads in the period 01 December 1998 to 07 January 1999, i.e. within only 37 days. While the media focuses predominantly on fatalities from these road accidents, the incidence of injuries and disability that people sustain from these occurrences is also vital. The picture presented here raises questions about the extent of head injuries and possible brain damage that is incurred by many South Africans.

TBI can have several detrimental consequences, such as changes in the personality profile, which can make an individual a stranger to familiar people such as family members, close relatives, and long term friends. TBI can also result in a decline in the victim's cognitive capacity, and his or her economic productivity, both of which place an enormous burden of care on family members. According to Fraser and Baarslag-Benson (1994), vocational outcomes for individuals with TBI reflect high unemployment rates, ranging between 50% and 80%. Martin (1988) states that the actual number of victims of TBI is larger than meets the eye, because an injury to a child (or to any other family member) also represents an injury to the family.

Diverse emotional changes can occur after brain injury which families find difficult to comprehend or tolerate (Lezak, 1988, cited in Miller, 1991). It is thus not uncommon for families with brain injured members to be emotionally stressed (Miller, 1993). What aggravates this situation is that improvement in cognitive functioning is often not accompanied by parallel progress in emotional functioning. Damasio (1985, cited in Yarnell & Rosie, 1990) reported discrepancies between intact extensive neuropsychological testing results (with much improved cognitive functions) and gross behavioural alterations (with poor utilisation of cognitive ability) in their study of a patient with frontal lobe injuries. Yarnell and Rosie (1990) also found a range of behavioural changes in their frontal lobe patients, which were present despite a generally good cognitive outcome, judged by neuropsychological testing and the initial return to society (e.g. scholastic position, competitive employment).

A study that seeks to generate a greater understanding of the impact of TBI on emotional functioning, and of premorbid factors that may mediate this impact, is therefore imperative. This knowledge could assist individuals with TBI and their families to cope better with the impact of these injuries.

A body of literature exists that examines the relationship between brain injury and personality functioning in general, and emotional functioning in particular (e.g. Lezak, 1983; Walsh, 1986). Different, and at times conflicting perspectives have been advanced to explain the nature of this relationship. In the light of this, it is would be useful to assess the current emotional functioning of individuals with frontal lobe brain injuries, and to compare this information with their premorbid emotional functioning as reported by significant others. The present study attempts to undertake this. This study utilises self-reports and ratings by the primary and secondary care-givers of individuals with TBI, and thus the patterns of emotional functioning that will be reported must be understood as referring to perceived emotional functioning. The ratings by the care-givers are important, for Prigatano (1992) states in his definition of personality : "Others who are familiar with the individual's daily behavioural characteristics may recognize emotional and motivational responses that the individual may not be fully aware of, or able to report subjectively" (p. 360).

Prior to examining the impact of TBI on emotional functioning, it would be useful to consider what the existing literature to date has found in relation to this issue. Thus the next two chapters will examine the literature on TBI and emotional functioning.

CHAPTER 2

THE HUMAN BRAIN: STRUCTURE, FUNCTION AND PATHOLOGY

2.1. Introduction

Prior to generating an understanding of the changes that result from injuries to the frontal lobe, it is useful to discuss the structure, organisation and function of the human brain in an intact (non-injured) brain. This is because unless the functional organisation of the healthy brain is well understood, one cannot adequately discuss other aspects of brain functioning such as its pathology.

According to Walsh 1985 (cited in Moss, 1991), there are two main approaches to neuropsychology. The first approach includes the test battery and cognitive approach and is essentially actuarial and quantitative in nature. This method focuses on the systematic application of a standard administered task in every neuropsychological assessment, and diagnosis is made by relating best score patterns to diagnostic categories (Moss, 1991). The second approach, characteristic of Luria's (1966, 1973) work, places less emphasis on quantification, and instead emphasizes qualitative observation (Walsh, 1985, cited in Moss, 1991). The discussion that follows in this chapter is based on Luria's (1973) theory of the functional systems of the brain, as this approach reflects the complexity of neurological functioning and describes both the processes and outcomes of brain functioning.

2.2 The human nervous system

The human nervous system is composed of two divisions: the central and peripheral nervous system. The central nervous systems (CNS) can be subdivided into six areas: the

spinal cord, brain stem, cerebellum, thalamus, basal ganglia and the cerebral hemispheres (Barr & Kiernan, 1983; Felten & Felten, 1982, cited in Arnadottir, 1990).
The cerebral hemispheres are paired structures composed of gray matter, which consists of a collection of nerve cells termed the cerebral cortex, and white myelinated axons of nerve cells that connect different areas in the hemispheres (Daube & Sandok, 1978, cited in Anadottir, 1990). The focus of this chapter is on the cerebral cortex.

The cerebral cortex is a layer of nerve cells approximately 5mm thick that form the outer surface of the cerebral hemispheres. The cerebral cortex is divided into four sections: the frontal, parietal, occipital and temporal lobes. The functioning of these lobes is consistent with Luria's division of the brain into functional units. Luria (1973) divides the brain into three units, on structuro-functional grounds. According to Luria, the brain is composed of three principal functional units, whose participation is necessary for any form of mental activity. These are: the unit for regulating tone and waking (Unit I), the unit for obtaining, processing and storing information from the outside world (Unit II), and the unit for programming, regulating and verifying mental activity (Unit III). Luria (1973) further categorises each of the three functional units into three cortical zones, which are hierarchically arranged. These zones are: the primary (projection) area, which receives impulses from or sends impulses to the periphery; the secondary (projection-association) area, where incoming information is processed or programmes are prepared, and finally the tertiary zones (zones of overlapping), which are responsible for the most complex types of mental activity requiring the participation of many cortical areas (Luria, 1973).

2.3. The frontal lobes

2.3.1 Anatomy

The frontal lobes constitute Luria's Unit III of the brain, that is, the unit responsible for programming, regulating and verifying mental activity (Unit III). On the lateral surface, the frontal lobe is composed of the area in front of the central sulcus, above the lateral fissure (Anadottir, 1990). According to Anadottir (1990), the medial boundary of the frontal lobe includes the anterior part of the corpus callosum. On the medial side, the frontal lobe is bounded by an imaginary line drawn between the central sulcus at the superior surface and the corpus callosum. There are three main sulci (precentral sulcus, superior sulcus, and inferior sulcus) on the superolateral surface of the frontal lobe, which divide it into four gyri (precentral gyrus, superior, middle and inferior frontal gyri). The inferior surface of the frontal lobe consists of two sulci, the olfactory sulcus and orbital sulcus and two gyri, the gyrus rectus and the orbital gyri.

2.3.2 Functions of the frontal lobes

The frontal lobes are the most recent of the structures of the cerebral cortex. They are the least differentiated areas of the brain, and their individual areas are thus the ones most capable of replacing one another (Anatoddir, 1990). The frontal lobes can be divided into three areas: the primary motor cortex, the premotor cortex and the prefrontal cortex. These areas correspond to Luria's primary, secondary and tertiary zones respectively. Information flows from the tertiary association areas in the prefrontal cortex, through the secondary association area in the premotor cortex, to the primary motor area or cortex (Anatoddir, 1990). The frontal lobes have seven functional areas. These are the primary motor cortex, the premotor cortex, the supplementary motor cortex, the frontal eye field, the motor speech area, the prefrontal cortex and the orbitofrontal cortex (Anatoddir, 1990).

The primary motor cortex

Barr and Kiernan (1983, cited in Anatoddir, 1990) describe the function of the primary motor cortex as being to receive input from the premotor cortex and somesthetic cortex, as well as the ventral lateral and ventral anterior nuclei of the thalamus. This area is responsible for muscle contraction, mainly of the opposite side of the body and for the execution of movement and the maintenance of simple movements.

The premotor cortex

The premotor cortex receives fibers from the ventral lateral and ventral anterior nuclei of the thalamus in addition to connecting with the other cortical areas (Barr & Kiernan, 1983, cited in Anatoddir, 1990). The premotor cortex co-ordinates movement and controls gross or postural movement (Daube & Sandok, 1983, cited in Anadottir, 1990). It also contributes to motor function by influencing the primary motor cortex as it develops programs for the motor routines necessary for skilled voluntary action; it is important for motor sequences (Barr & Kiernan, cited in Anadottir, 1990).

The supplementary motor cortex

The supplementary motor cortex is located in front of the motor areas on the medial side of the hemisphere. It is a continuation of the lateral premotor cortex. According to Stuss and Benson (1986, cited in Anatoddir, 1990), the supplementary motor cortex seems to provide the drive for the initiation of movements, rather than being involved in the execution of movements. This area is said to co-ordinate internal needs with external demands in order to initiate motor programs. This co-ordination refers to both new and previously established programs, including motor speech.

The frontal eye field and the motor speech area

The frontal eye field, located anterior to the premotor area, is concerned with voluntary eye movements on the opposite side of the stimulation. The motor speech area, located in the inferior frontal gyrus of the left cerebral hemisphere, controls the programming of speech (Daube & Sandok, 1983, cited in Anadottir, 1990). This area receives numerous connections from the temporal and parietal lobes via pathways in the cingulum and the superior fasciculus (Barr & Kiernan, 1983, cited in Anatoddir, 1990).

Th prefrontal cortex

The prefrontal cortex or the tertiary cortical areas of the frontal lobe, can be divided into two functional areas. These are the dorsolateral frontal cortex, which is part of the frontal association area, and the orbitofrontal cortex at the base and the medial aspects of the frontal lobe. According to Luria (1980, cited in Anatoddir, 1990), the prefrontal cortex is phylogenetically young and takes longer to myelinize than other cortical areas. It is more vulnerable than other areas to functional disturbances. The prefrontal cortex is concerned with aspects of memory, emotion, and intellectual functions (Daube & Sandok, 1983, cited in Anatoddir, 1990). The prefrontal cortex monitors and controls behaviour through higher mental functions, such as judgement and foresight.

Luria (1973) states that the prefrontal cortex is important in the maintenance and control of cortical tone. It integrates information, both from the individual and the outside environment, and subsequently regulates the behaviour of the organism according to the outcome of its actions. The prefrontal area also selects appropriate responses among available responses. These areas regulate higher forms of organised conscious activity, voluntary movement, memory or cognition.

With regard to the differentiation of functional areas of the prefrontal cortex, the dorsolateral cortex is important in initiating and planning action. Intellectual activity seems associated more with the dorsolateral cortex than with activity in the orbitofrontal areas. The orbitofrontal cortex houses areas that are important to consciousness or arousal; it contributes to the regulation of cortical activation, selectivity of functions, personality, emotions, and memory (Luria, 1980, cited in Anadottir, 1990).

In summary, the frontal lobes are concerned with the execution of movement, motor control, and planning. They are also concerned with higher mental functions, such as intellectual functions, memory and emotion. As Stuss and Benson (1983, cited in

Anadottir, 1990, p. 40) state, these are sub-components of personality or the "sum characteristics or qualities that make an individual a unique and an intelligent being".

2.3.3. Pathology of the frontal lobes

Frontal lobe lesions cause motor and neurobehavioural deficits, including personality changes, emotional changes and memory deficits (Damasio, 1985; Strub & Black, 1985; Stuss & Benson, 1986, cited in Anadottir, 1990). These changes are associated with lesions on different and specific areas of the cortex. Lesions on the frontal lobe are therefore of major relevance to the present study.

Primary Motor Cortex

Lesions on the primary motor cortex results in flaccid paralysis or muscle weakness, depending on the extent of the lesion. On the other hand, a lesion of the premotor area occurring in conjunction with a lesion of the primary motor area, results in a spastic, hyperreflexive paralysis.

Premotor Cortex, Frontal Eye Field and Motor Speech Area

A lesion in the premotor cortex, which programmes skilled motor activity, results in apraxia and premotor perseveration (Anadottir, 1990). Apraxia is defined as "a disorder of skilled, purposeful movement that is neither caused by deficits in primary motor execution nor comprehension problems" (Heilman & Rothi, 1985, cited in Anadottir, 1990, p.126). Different types of apraxia include motor apraxia and ideational apraxia. Motor apraxia is a loss of kinesthetic memory patterns so that purposeful movement cannot be achieved, even though the tasks are understood (Siev et al., cited in Anatoddir, 1990). According to Ayres (1985, cited in Anatoddir, 1990) ideational apraxia is a breakdown in knowing what is to be done.

As pointed out in the foregoing section, cortical areas such as the frontal eye field and the motor speech area are located adjacent to the premotor cortex. Thus disturbances of speech, for instance Broca's aphasia, characterised by the loss of speech production and eye movement, can result from lesions on the premotor cortex or from these adjacent cortical areas.

Premotor preservation is another sign of lesion on the premotor cortex of the frontal lobe. In this case patients have difficulty in shifting from one response to another (Anatoddir, 1990). Patients with this condition have difficulty changing from one pattern of response to another.

Prefrontal Cortex

The prefrontal cortex is a functional extension of the premotor cortex associated with cognitive aspects. Some deficits in this area can be localised to the dorsolateral areas, others to the orbitofrontal areas, and others are common to lesions of either location.

Dorsolateral prefontral cortex

According to Luria (1980, cited in Anatoddir, 1990), the dorsolateral prefrontal cortex is concerned with executing goal-directed activities. Luria states that a lesion on the dorsolateral prefrontal cortex may result in a lack of intention to perform a motor task, as well as lack of attention to the command and regulation of complex action. Furthermore, problems in planning, organising and sequencing steps may also occur. Organisation problems affect not only motor functions but also mental activity. Disability in noting errors may also be observed, because the person is unable to compare the performance with the initial intention. Inadequate and stereotypic actions will not be inhibited and will instead replace goal-directed actions corresponding to specific tasks. Faulty cognition, concrete thoughts, and diminished problem solving ability also occur with dorsolateral lesions. Intellectual deficits also occur more often as a result of dorsofrontal lesions than orbitofrontal ones. Loss of abstraction or decreased flexibility of conceptual behaviour resulting in the use of concrete thoughts and problem solving may also result from injury to the dorsolateral cortex. Prefrontal perseveration, manifested in inertia in relation to a particular task and an inability to change over to other tasks, also results from a lesion in the prefrontal cortex.

Orbitofrontal Prefrontal Cortex

According to Luria (1980, cited in Anadottir, 1990), the orbitofrontal cortex has close connections to limbic structures. Lesions on this structure thus cause disturbances in emotions, personality, consciousness, cognition or higher cognitive functions.

According to Luria (1980, cited in Anadottir, 1990), the emotional impairments or affective disorders that occur with orbitofrontal lesions include aggression, apathy, euphoria, frustration, irritability, pseudodepression and restlessness. These impairments may be related to altered cortical tone or a lack of the inhibitions necessary for regulating behaviour. There are fluctuations in mood that are not consistent with changes in external stimuli nor with the intensity of these emotional changes. Depression with sad affect or expression may be evident, yet the depression does not seem to be profound. Lability, where there are mood-swings out of proportion with external stimuli, resulting in inappropriate cries or laughs, may also be displayed. Patients with orbitofrontal lesions may reveal psychopathic-like behaviour, and yet lack the necessary goal-directed organisation for the behaviour to be effective (Damasio, 1985, cited in Anatoddir, 1990). According to Damasio, anxiety and judgement are diminished in patients with lesions to the orbitofrontal cortex.

Impaired judgement is also commonplace in prefrontal damage. There may be a lack of judgement, a lack of identification of one's own errors and of self-criticism, as well as diminished awareness of social rules (Luria, 1980; Damasio, 1985, cited in Annadottir, 1990). Lack of insight is another feature of lesions to the orbitofrontal prefrontal cortex. Patients with this condition may lack insight into their condition and make unrealistic comments regarding their disease or disability, such as being able to return to work soon despite recent extensive paralysis. Impaired memory is another characteristic of these patients. They may have severe short-term memory deficits. According to Luria (1980) this is due to a generalised loss of cortical tone. They are unable to learn from their mistakes and tolerate new strategies due to a lack of recent memory and memory-storage problems. Impaired motivation and drives are also common. Listlessness and diminished sexual drives may be present in patients with prefrontal lobe damage. Speech deficits are also associated with prefrontal lesions.

Affective disorders have been associated with hemispheric differences. Heilman et al. (1983, cited in Anadottir, 1990) have suggested that patients with right hemisphere damage have difficulty expressing or interpreting emotions. Geschwind (1979a, 1979b) discriminated between types of emotional reactions, depending on which hemisphere has been affected by the lesion. Geschwind stated that lesions on the left side are accompanied by feelings of loss, in which the patient is disturbed by the disability, and may be depressed. Lesions in the right hemisphere, on the other hand, result in inappropriate emotional responses regarding the patient's own condition as well as impaired recognition of emotion in others.

2.4. Introduction to the parietal, occipital and temporal lobes

While the frontal lobes are clearly linked in the literature to the emotional changes that occur following TBI, it would still be useful to present an overview of what the other lobes namely, the parietal, occipital and temporal lobes are concerned with. This overview would illustrate how emotional changes are mainly linked with the frontal lobes rather with the other lobes. It must be added, however, that despite their respective specialisation in different functions, the different parts of the brain cannot be considered as discrete functional entities. As Finger et al. (1988, cited in Anadottir, 19990) state, there is no part of the brain that functions on its own, insulated from the activities of other parts of the overall system.

2.5. The parietal lobes

2.5.1. Anatomy

The parietal lobe has two boundaries based in anatomical landmarks on the lateral surface: the central and the lateral sulci. It also has boundaries consisting of two hypothetical lines. One of these is drawn between the parieto-occipital sulcus and the preoccipital notch: the other is drawn from the middle of the previously established line in the lateral sulcus. According to Barr and Kiernan (1983, cited in Anadottir, 1990), the parietal lobe is distinguished medially from the frontal lobe by the imaginary line between the central sulcus above, the corpus callosum and calcarine sulcus below, and the parieto-occipital sulcus posteriorly.

2.5.2. Functions of the parietal lobes

According to Anadottir (1990) the parietal lobes have three functional areas that can be classified as primary, secondary and tertiary zones on the basis of functional complexity. These are the primary sensory area, the superior parietal lobule, and the inferior parietal lobule, respectively. The flow of information in the parietal lobe is from the primary sensory area via the secondary functional area in the superior parietal lobule to the tertiary functional area in the inferior parietal lobule.

The primary sensory area

The primary sensory cortex, situated in the post-central gyrus, is the primary receiving area for sensation. The role of the primary sensory cortex is the detection of fine touch, proprioception, and kinesthesia. Electrical studies have indicated localised feelings of numbness and tingling sensations depending on the placement of electrical stimulation.

The superior lobule

The secondary area in the parietal lobule, the sensory or somesthetic association cortex situated mainly in the superior parietal lobule, is responsible for integrating functions from multiple sensory sources (Barr & Kiernan, 1983; Daube & Sandok, 1978; cited in Anadottir, 1990). According to Daube and Sandok, the function of the sensory association cortex of the parietal lobes is to coordinate, integrate, and refine the perception of external sensory input. It deals mainly with discriminative aspects of tactile sensation, which include tactile localisation and stereognosis, or identification of objects by tactile discrimination based on size, shape, and texture (Daube & Sandok, 1978; William & Warwick, 1980, cited in Anadottir, 1990).

The inferior parietal lobule

The inferior parietal lobule is a part of the posterior tertiary area which combines information from the three posterior lobes: the parietal lobe, the temporal lobe, and the occipital lobe (Luria, 1980, cited in Anadottir, 1990). Complex functions that require the integration of functions of different cortical areas take place in this zone. These include gnosis, praxis, and body scheme, which have been associated with the parietal part of the zone. The term *gnosis* refers to recognition, beyond perception of sensory input, and this may be tactile, visual, or auditory in nature (Bauer & Rubens, 1985, cited in Anadottir, 1990). *Praxis* includes ideation, concept formation, planning, and motor execution. *Body scheme* is defined by Siev, Freishtat and Zoltan (1985, cited in Anadottir, 1990) as a postural model related to the perception of one's own body parts. This is also based in the integration of visual and somesthetic information as well language and feedback from interaction of the body with the environment. Another function located within the left parietal lobe is a part of Wernicke's speech area, or the auditory association cortex, which deals with the interpretation of auditory stimuli.

2.5.3. Pathology of the parietal lobes

Primary Sensory Cortex

Damage to the primary somatosensory cortex located in the postcentral gyrus on one side results in sensory deficits on the (contralateral) opposite side if the body (Daube & Sandok; Werner, 1980, cited in Anadottir, 1990). These deficits include lack of light-touch sensation and conscious priorperception, which refers to the conscious awareness of information from joints, muscles, tendon and ligaments (Daube & Sandok, 1978; Werner, 1980, cited in Anadottir, 1990).

Superior parietal lobule

A lesion in the secondary parietal area, which is the somesthetic association cortex located in the superior parietal lobule, can result in loss of discriminative tactile and proprioceptive sensation, including localisation of touch, two-point discrimination, sharp-dull discrimination, grapesthesia and stereognosis. According to Anadottir (1990), grapesthesia refers to the ability to recognise figures, such as letters and forms, traced on the subjects' hand while vision is occluded. Stereognosis refers to the ability to recognise objects and forms by touch only. This recognition requires the person to be able to discriminate between shape, texture, size and weight with vision occluded (Anadottir, 1990).

Inferior parietal lobule

The neurobehavioural deficits related to dysfunction of the tertiary area in the inferior parietal lobe can be divided into four main categories: apraxias, agnosias, spatial-relation disorders and body scheme disorders (Daube & Sandok, 1978; Matthews and Millers, 1975; Werner, 1980, cited in Anadottir, 1990). *Apraxia* has been defined in the preceding discussion on frontal lobes as the inability in the absence of paralysis, sensory loss or disturbance of co-ordination, to voluntarily perform learned complex acts (Daube & Sandok, 1978, cited in Anadottir, 1990). Daube and Sandok (1978) define *agnosia* as the inability to perceive the significance of sensory input received by the primary cortical areas (cited in Anadottir, 1990). The *spatial relations syndrome* includes defects common to apraxias and agnosias, according to Siev et al. (1986, cited in Anadottir, 1990). Siev et al. relate the following symptoms to inferior parietal lobule dysfunction: difficulty with differentiating foreground from background, difficulty with form constancy, inability to interpret and deal with concepts related to spatial positioning of objects, difficulty with spatial relations; constructional apraxia, topographical disorientation; and perceptual deficits related to depth and distance. *Body scheme disorders* are related to deficits in the perception of body position and of the relationship of body parts to each other, according to Siev et al. (1986, cited in Anadottir, 1990).

2.6. The Occipital Lobes

2.6.1 Anatomy

The occipital lobe occupies mainly the medial surface of the hemisphere. On the surface it is separated from the parietal lobe by the parieto-occipital sulcus and the calcarine sulcus. It is separated from the temporal lobe by the imaginary line between the tip of the calcarine sulcus and the preoccipital notch. On the lateral surface it is separated from the temporal and parietal lobes by an imaginary line from the parieto-occipital sulcus to the preoccipital notch (Barr & Kiernan, 1983; Netter, 1983, cited in Anadottir, 1990).

2.6.2. Functions of the occipital lobes

The occipital lobes are concerned essentially with vision. They have a primary sensory area and a secondary visual association cortex. The border area of the occipital, temporal, and parietal lobes contributes to the posterior tertiary association zone. The primary visual areas are located on the medial side of the occipital lobes around the calcarine fissure, identified as Brodmann's area 17 (Daube & Sandok, 1978, cited in

Anadottir, 1990). The images from the right half of space in both eyes are transmitted to the left visual cortex, whereas the left visual field from both eyes goes to the right hemisphere. Adjacent to the primary visual areas are the visual association areas (Brodmann's areas 18 and 19) which synthesise visual impressions, integrate them with other sensory modalities, and aid in the formation of visual memory traces (Daube & Sandok, 1978, cited in Anadottir, 1990).

2.6.3. Pathology of the Occipital Lobes

Primary Visual Cortex

According to Anadottir (1990), lesions on the primary visual cortex cause a visual-field defect. Unilateral lesions that affect the primary visual cortex of the occipital lobe cause a homonymous visual loss in the opposite visual fields.

Visual association cortex

Lesions of the association areas of the occipital lobes can contribute to agraphia, constructional apraxia, spatial relation deficits, acalculia and alexia. Agraphia, apraxia, and spatial relation deficits were described in the previous sections on the frontal lobe and parietal lobe dysfunctions. Levin and Spieries (1985, cited in Anadottir, 1990, p. 180) define acalculia as "an acquired disorder of calculation". Friedman and Albert (1985, cited in Anadottir, 1990, p. 180) define alexia as "an acquired inability to comprehend written language as a consequence of brain damage".

Lesions of the association areas can also result in visual-object agnosia, prospagnosia, associative visual agnosia, and colour agnosias. According to Bauer and Rubens (1985, cited in Anadottir, 1990, p.183), visual-object agnosia is the "inability to respond appropriately to visually presented material even though visual sensory processing, language and general intellectual functions are preserved at sufficient levels. This recognition deficit is limited to visual stimuli. According to Strub and Black (1985, cited in Anadottir, 1990, p.183), prospagnosia refers to the inability to recognise familiar faces, despite the fact that recognition by voice is possible. Colour agnosia is defined by Black and Strub (1985, cited in Anadottir, 1990, p. 184), as the inability to recognise colours because of an acquired cortical lesion.

In summary, dysfunctions of the occipital lobe can result in visual-object agnosia, prospagnosia, associative visual agnosia, and colour agnosias.

2.7. The Temporal Lobes

2.7.1. Anatomy

The temporal lobe is separated from the occipital lobe at the lower end by an imaginary line drawn between the anterior end of the calcarine sulcus and the preoccipital notch (Barr & Kiernan, 1983, cited in Anadottir, 1990). This lobe is divided laterally by two sulci (superior and inferior temporal sulci) into three gyri (superior, middle, and inferior temporal gyri). The superior temporal gyrus runs into the supramarginal gyrus at the level of the parietal lobe, and the middle temporal meets the angular gyrus of the inferior parietal lobule (Barr & Kiernan, 1983, cited in Anadottir, 1990).

2.7.2. Function of the temporal lobes

The temporal lobes play an important role in auditory, memory and learning, emotional and visual functions. These lobes house the primary receptive area for hearing, as well as secondary and tertiary cortices.

In terms of structure, the temporal lobes contain the primary auditory cortex, located in the superior temporal gyrus or Herschl gyrus (Brodmann's areas 41 and 42), which is concerned with the reception of auditory information (Daube & Sandok, 1978; Netter, 1983, cited in Anadottir, 1990). Each auditory cortex receives input from both ears, but the connections to the contralateral side are stronger than the ipsilateral connections

(Geschwind, 1979a, 1979b, cited in Anadottir, 1990). The dominant temporal lobe plays a primary role in language functions (Daube & Sandok, 1978, cited in Anadottir, 1990). The auditory association area surrounding the primary cortex, Wernicke's area (Broadmann's area 22), is concerned with the interpretation of auditory information. Wernicke's area on the left side is concerned with language comprehension, whereas its counterpart on the right side is concerned with tones, loudness, sound modulation and timing (Kaupfermann, 1985a, cited in Anadottir, 1990). In addition to language processing, the tertiary association area in the temporal lobe is concerned with some aspects of pattern recognition and higher visual coordination (Geschwind, 1979a, 1979b, cited in Anadottir, 1990).

The anterior part of the temporal lobe, the temporal pole, is a tertiary functional area and a part of the limb association cortex. It is concerned with emotional behaviour, as are the frontal lobes (Netter, 1983, cited in Anadottir, 1990). According to Kauperfermann (1985a, cited in Anadottir, 1990), the tertiary association area in the temporal lobes are involved in learning and memory of higher order visual tasks and auditory patterns. Kaupfermann (1985) states that the inferior temporal lobe includes a higher order visual region that is concerned with the rate of learning visual tasks. The superior temporal cortex is involved with learning auditory patterns. The right hemisphere is important for remembering patterns of spatial input, whereas the left side is involved in verbal memory (Geschwind, 1979a, 1979b; Kaupfermann, 1985a, cited in Anadottir, 1990).

Walsh (1987) states that the temporal lobes, because of their complicated connections with all the other cortical areas, play an important role in the integration of aspects essential to emotion and motivation.

2.7.3. Pathology of the temporal lobes

Primary Auditory Cortex

A unilateral lesion involving the primary auditory cortex on the one side causes diminished acuity of hearing in both ears. The loss is greater in the ear opposite to the lesion. The impairment is slight, and is difficult to detect by clinical tests (Barr & Kiernan, 1983, cited in Anadottir, 1990).

Auditory association cortex

According to Anadottir (1990), lesions of the auditory association cortex, or posterior portion of the left superior temporal gyrus cause receptive aphasia, or Wernicke 's aphasia. This is a comprehension deficit caused by a severe auditory processing deficit resulting in the inability to understand spoken language. A lesion in the right hemisphere in the superior temporal gyrus causes impaired comprehension of tonal sequences and timing of sounds, as well as of sound modulation. Alexia and agraphia are also associated with this disorder.

Other deficits that may result from lesions to the temporal lobe include auditory agnosia, which is defined as the "inability to recognise differences in sounds" (Sieve et. al, 1986, cited in Anadottir, 1986). Visual-field defects may result from temporal lobe lesions, due to the structure of the visual pathway (Daube & Sandok, 1978, cited in Anadottir, 1990). A lesion of the temporal lobe may result in a right-field deficit, whereas a lesion on the right side may produce deficits in both right and left visual fields, according to Walsh. The temporal lobes are important for the integration of visual experiences with input from all other senses.

According to Burtter (1979, cited in Anadottir, 1990), lesions of the left temporal lobe result in difficulties with learning and retaining verbal material that is presented either verbally or visually. Lesions of the anterior sector of the left temporal lobe can result in anterograde amnesia , which is a storing problem resulting in a recent memory deficit. Lesions of the posterior, or tempo-parietal region, on the other hand, produce retrograde memory problems in which the patient cannot remember what happened previously. The anterior temporal pole is a part of the limbic association area. Lesions of this area or its connections can result in emotional disorders.

In summary, the temporal lobes are involved in acuity of hearing, Wernicke's aphasia, alexia and agraphia, amusia and memory loss.

2.8. Conclusion

According to Anadottir (1990), the cerebral cortex is specialised in function, that is, specific parts of the brain are more efficient than others for particular functions. Thus, lesions of the primary receptive areas produce identifiable functional deficits. Lesions of secondary association areas usually produce unimodal deficits or impaired processing of information from one sensory modality only, while lesions of tertiary areas result in deficits that depend on the combined function of more than one cortical location. Some common neurobehavioral deficits can be matched with dysfunctions of specific functional areas.

However, despite their respective specialisation in different functions, the different parts of the brain cannot be considered as discrete functional entities. There is no part of the brain that functions on its own, insulated from the activities of other parts of the overall system (Finger et al. 1988, cited in Anadottir, 1990). For instance, Prigatano (1988) states that "emotional and motivational disturbances can emerge after injury to almost any part of the brain. However, it is more likely that the patient may not cognitively grasp a situation properly and may therefore show an inappropriate emotional-motivational response when the frontal lobes are damaged" (cited in Anadottir, 1990, p. 345). As Anadottir (1990) states, only when it is eventually possible to observe the dynamic interactions between brain areas that an understanding may emerge of complex and subtle roles played by particular parts of the brain, that is, if it is viable to maintain that the brain has separate components.

The present chapter has described the structure, function and pathology of all the four lobes of the cerebral cortex. The main focus of the next chapter is the frontal lobes, since these are more often described in the literature as concerned with emotional functioning. The chapter will focus on the controversy that has emerged in the literature with regard to the relationship between traumatic frontal lobe injury and the emotional changes associated with it.

CHAPTER 3

PERSPECTIVES ON THE RELATIONSHIP BETWEEN TRAUMATIC BRAIN INJURY (TBI) AND EMOTIONAL FUNCTIONING

3.1. Introduction

In the foregoing chapter, the anatomy, function and pathology of various parts of the human brain were discussed. With regard to pathology, the previous chapter discussed TBI in general, and highlighted the deficits that result from injury to the different lobes of the cerebral cortex. This chapter focuses specifically on frontal lobe TBI. It reviews the literature that has examined the emotional changes that are associated with injury to the frontal lobes. Different perspectives on the nature of the relationship between frontal lobe TBI and emotional functioning are explored.

Prior to a discussion of these perspectives, it must be emphasized that this study focuses on malfunctioning or maladjustment of individuals with TBI in the period following their injury, rather than on their unique personality attributes. According to Dahlstrom (1972), personality tests were developed to accomplish one of two different but related tasks. The first task involves "the measurement and depiction of the person's enduring attributes and stylistic characteristics", while the second is "concerned with malfunctioning and pathology" (cited in Maloney and Ward, 1976, p. 340). The present study focuses more on detecting maladjustment or malfunctioning after TBI, rather than describing the enduring traits of individuals with TBI which may be non-pathological.

An analysis of the literature on the relationship between TBI and personality functioning, particularly emotional functioning, indicates that there is no consensus on the exact nature of this relationship. The literature is characterised by four major viewpoints. The first view, which is the most dominant, asserts that brain injury and particularly injury to the frontal lobes, often causes profound personality changes, including changes in emotional functioning, amongst patients (Lezak, 1983, 1995; Miller, 1991). The second perspective holds that individuals' premorbid personality factors, including premorbid emotional functioning, are important determinants of the outcome of brain injury and of the individual's response to the injury (Donovick & Burright, 1989; Grafman, Lalonde, Litvan & Fedio, 1989; Prigatano, 1987, 1992). The third view, which does not deviate much from the first view except for a difference of emphasis, holds that changes in emotional functioning after traumatic brain injury are associated with hemispheric damage (Borod, 1992, Cullum & Bigler, 1988). That is, emotional changes are determined by the hemisphere on which the injury has occurred. The fourth perspective postulates that both premorbid factors and the nature of the traumatic brain injury (that is, site and severity of lesion) are instrumental in producing the observed effects of the damage (Lee, Loring & Meador, 1993).

As the discussion in this chapter will show, each of the four viewpoints has a degree of validity, since several studies have illustrated that certain attributes of an individual's personality can change profoundly as a result of brain damage. Also, as the literature on TBI shows, certain aspects of personality can mediate the impact of brain damage.

3.2. Impact of traumatic brain injury (TBI) as a principal determinant of changes in personality/emotional functioning

Several authors, arguing from the first viewpoint, assert that damage to the frontal lobes of the brain results in personality changes that are commonly referred to as the 'frontal lobe syndrome' (Lezak, 1983, 1995; Miller, 1991, 1993; Walsh, 1978). This syndrome ② encompasses features such as depression, emotional lability, anger, irritability, aggression, euphoria, apathy, childishness, inflexibility, egocentricity, and low frustration tolerance (Lezak, 1983, 1995; Miller, 1991, 1993; Walsh, 1978). Since the features encompassed in the frontal lobe syndrome will be the key focus of this study, it would be useful to define

them. These constructs are only briefly defined as the concern of the present study is with how they are altered by TBI, and not with an in-depth investigation of these constructs.
For purposes of their study, Lee et al. (1993) defined depression as “sustained crying, tearfulness or sobbing with sad affect”, in people with TBI (p. 160). Lee et al. (1993) went on to define euphoria as” sustained periods of laughter or elated or expansive mood as evidenced by giggling, cheerfulness, or joking’” (p. 160). Irritability is defined as “a tendency to be easily annoyed or upset” (Prigatano, 1992, p. 363). Anger, on the other hand, is described as “a threatening, arousal-generating response that either signals physical aggression or is in itself a verbal attack on another. It may be seen as an exaggerated or heightened irritability response that includes a lowered frustration tolerance and possibly a heightened emotional lability (Prigatano, 1992, p. 364). According to Prigatano (1992), in both the people with TBI and non-brain injured people, anger often occurs in response to frustration. Apathy refers to shallow affect, blunted emotional responses, and indifference to emotional stimuli such as pleasure or pain (Anadottir, 1990). It is accompanied by slow performance and inaction (Anadottir, 1990).

④ Euphoria is one of the frequent emotional changes that are observed in people with traumatic brain injuries. Lezak (1983, 1995) points out that while most brain damaged people undergo adverse emotional changes, there are a few others for whom brain damage seems to make life more pleasant. This is illustrated by those emotionally restricted, anxious, overly responsible people who are more easygoing and relaxed as a result of their brain injury (Lezak, 1983, 1995). Self-neglect, defined as the neglect of personal hygiene, has also been reported in patients with frontal lobe dysfunction (Oral, Sahakian & Bergmann, 1989). Benton (1968, cited in Walsh, 1978) also supports the concept of the frontal lobe syndrome, and points out that bilateral frontal damage causes personality changes such as diminished anxiety and concern for the future, impulsiveness, facetiousness and mild euphoria, and lack of initiative and spontaneity (p. 117).

Stuss et al. (1992) agree with the foregoing position that the primary change after frontal lobe damage is a disorder of personality. However, Stuss et al. (1992) argue further that these changes are not a monolithic frontal syndrome, but include a diversity of disturbances in emotional functioning. These scholars state that symptoms of frontal lobe damage that have been labelled as emotional disturbance may be classified as disorders of drive or motivation, mood (subjective emotional experience), and affect (emotional expression) (Stuss et al., 1992).

In the same vein, Bigler (1988) points out that:

> "the so-called "frontal lobe syndrome" is not characterised by unitary clinical features, but will usually consist of all or a combination of the following: changes in emotional regulation (although the dyscontrol can go in either direction - ie. hypo- to hyper-emotionality), a change in drive with a tendency towards amotivational states, change in creativity and originality, poor impulse control, distractibility and impaired attention, and changes in memory along with diminished flexibility in thinking and perseveration" (pg. 280).

Silver and Yudofsky (1987, cited in Zwil, McAllister & Raimo, 1992), also point out that episodic aggression and behavioural dyscontrol are also associated with brain injury, and they frequently occur with mood lability, distractibility and manic states in patients with frontal lobe injury. This syndrome is also known as episodic dyscontrol.

At an interpersonal level, Lezak (1983, 1995) indicates that individuals with frontal lobe damage are rarely able to form or maintain close relationships. She further states that individuals with such damage are at best a nuisance at home and at worst a terror (Lezak, 1983, p. 170). Those who have not been rendered silly, euphoric or apathetic by their frontal lobe injuries are often lonely and depressed (Lezak, 1983, 1995). Furthermore, Lezak (1983, 1995) also states that brain damage can result in an increased sexual drive in a patient, which places extraordinary demands on his/her spouse. Conversely, brain damage can cause a decline in sexual interest, which leaves the spouse feeling unsatisfied and unloved.

At another level, Benton (1968, cited in Walsh, 1978) sounds a warning that personality factors should not be seen in isolation from cognitive or intellectual changes resulting from frontal lobe damage. Important cognitive changes associated with brain damage are:

impaired integration of behaviour over a period of time, impairment in recent memory, loss of the capacity to think in abstract terms and an inability to plan and follow though a course of action, and to take account of the probable future consequences of one's actions (Benton, cited in Walsh, 1978, pp. 117-118).

3.3. The role of premorbid factors as determinants of emotional functioning after TBI

Another perspective on the relationship between brain damage and personality is presented by researchers who assert that changes observed after traumatic brain injury cannot be attributed to the impact of the injury alone. Authors such as Grafman et al. (1989) contend that the psychiatric (also emotional and behavioural) sequelae of brain damage are variable and are unlikely to be produced by a single factor. They argue that premorbid factors, particularly personality characteristics, are important determinants of long-term behavioural outcome of brain injury (Grafman et al., 1989). Prigatano (1987) also states that premorbid intellectual, personality, and socio-cultural characteristics of brain injured individuals interact with acquired brain damage to produce a complex symptom picture which involves personality disturbances and cognitive disorders.

Furthermore, Lezak (1983) also recognizes the role of premorbid personality factors in mediating the impact of brain damage. She states: "Premorbid personality colours the quality of the patients' response to his disability. Thus the clinician should not be tempted to predict the site of the damage from the patients' mood alone" (Lezak, 1983, p.62).

Several aspects of premorbid emotional functioning have been identified that influence the outcome of brain damage. Grafman et al. (1989) draw from the work of authors such as Brooks (1984) and Prigatano (1986) who concur that individuals with prior emotional or characterological instability may be at risk for manifesting an organic manic mental syndrome, a post-concussion or post-traumatic stress disorder, depending on the severity of the injury. Drawing further from studies conducted by Panting and Merry, Grafman et al.

assert that: "Thus a premorbidly hostile, carping, and overly anxious individual is likely to manifest irritability, anger or belligerence; an emotional dyscontrol after brain damage is more probable by patients who evinced emotional lability before the accident" (p. 290).

This viewpoint is also echoed by Stuss and Benson (1986, cited in Lee et al., 1993), who contend that in their response to brain injury, characteristically outgoing individuals (extroverts) become euphoric or the more reserved and shy (introverts) become depressed. Similarly, Odd and Humphrey (1980, cited in Grafman et al., 1989) also found that individuals who remained unemployed two years after their injury, were described as "nervous and suspicious" prior to the accident, suggesting that such patients were premorbidly disposed to mood changes following their injuries. Odd and Humphrey (1980, cited in Grafman et al., 1989) do not specify the nature of these mood changes. These findings differ from those of authors such as Lezak (1983, 1995) who, while accepting the mediating role of premorbid personality characteristics, emphasize the role of brain injury as being primarily responsible for rendering TBI victims unemployable. In this instance, Lezak (1983, 1995) seems to understate the role of the victims' premorbid functioning.

Several other authors also contend that the premorbid behavioural characteristics of the head-injured individual clearly impact on his or her integration with family and society (Brooks, 1984; Brown et al., cited in Donovick & Burright, 1989). Donovick and Burright (1989) state that the interpersonal difficulties that are often attributed to brain injury appear to be "exaggerations" of behaviour patterns expressed prior to the injury in a given individual. Donovick and Burright point out that difficulties in impulse control are in most cases associated with individuals with prior antisocial tendencies. These authors argue that individuals with such tendencies are at risk for close-head injury, and the disinhibition seen after the injury is thus not a new pattern of behaviour, even though it may become a prominent characteristic of the individual. Donovick and Burright also mention that a history of brain damage may further increase the risk of future head injury and other neurological disorders.

It is essential to consider the premorbid emotional functioning of individuals with traumatic brain injuries, as several authors have pointed out that psychological (particularly emotional) factors may complicate recovery following head injury (Barth et al., 1983; Bond, 1975; cited in Diamond, Barth & Zillmer, 1988). It has been asserted that an individual's psychological response to the traumatic brain injury may lead to a reinforcement and persistence of disability (Artiola et al., 1980; Barth et al., 1983; cited in Diamond et al., 1988). Collier (1979, cited in Diamond et al., 1988) proposes that functional impairment coupled with emotional factors such as anxiety and distress may prolong and intensify disability.

Prigatano (1987) poses a question as to whether premorbid variables may actually contribute to the likelihood of suffering brain injury in the first place. He points out that some psychological theories suggest that the pre-existing psychosocial state of the individual can put him or her at risk for brain injury. Prigatano concedes, however, that there are immense methodological problems in measuring this. Grafman et al. (1989) also contend that pre-existing psychiatric disorders may put an individual at a greater risk of experiencing a traumatic brain injury (e.g. antisococial tendencies such as being intoxicated and reckless when driving). Grafman et al. also admit that issues surrounding premorbid personality and post-injury behavioural changes are too complex to be resolved at a given point in time.

3.4. Interhemispheric Specialization

Borod (1992) defines hemispheric specialization as "the notion that certain higher functions are differentially represented in the two hemispheres and are predominantly affected by damage to the one hemisphere" (p. 339). Hemispheric asymmetries for emotional functioning have been a subject of exploration in the field of neuropsychology for many decades. As early as 1948, Goldstein (cited in Cullum & Bigler, 1988) observed that patients with left hemisphere damage tended to manifest depressive symptomatology. He noted in particular that they exhibited "catastrophic reactions", that is, "an exaggerated negative response beyond what would normally be expected" (Goldstein, 1948, cited in Cullum and Bigler, 1988, p. 332). In other studies, by contrast, patients with right hemisphere damage were found to manifest attributes such as indifference, euphoric reactions, or denial of illness (Denny-Brown et al. 1952; Hecaen et al., 1951, cited in Cullum & Bigler, 1988). Gainotti (1972, cited in Cullum & Bigler, 1988, p.332) also observed that patients with left hemisphere damage often manifested 'anxious-depressive reactions, swearing, tearful outbursts, and depressive self-statements in response to failure on a variety of psychological measures. Gainotti (1972) further noted that patients with right hemisphere damage tended to manifest indifference reactions, including minimization and joking (cited in Cullum & Bigler, 1988).

Lezak (1983, 1995) corroborates the finding that there are hemispheric differences in the victim's emotional reactions to brain damage. She states that patients with left hemisphere damage report feelings of depression more often than do their counterparts with right hemisphere damage who often feel euphoric. According to Lezak (1983, 1995), patients with left hemisphere injuries are more likely than those with right sided injuries to exhibit a catastrophic reaction that may appear as acute, disorganising anxiety, agitation or tearfulness. Cullum and Bigler (1988) point out that the association between depression and cerebral damage seems to represent more than a functional reaction to a loss of ability. These authors cite workers such as Berrios and Samuel (1987) who reported that the characteristic depressive symptoms exhibited by neurological patients tend to be different from those of psychiatric depressed patients.

Despite the apparent coherence in the argument for hemispheric differences in emotional functioning after brain injury, studies conducted by other workers have found that locating lesions along left-right dimensions is not reliably associated with depressive symptoms (Finklestein, 1982, cited in Cullum & Bigler, 1988). Furthermore, Folstein et al. (1977, cited in Cullum & Bigler, 1988) found greater depression amongst stroke patients with right as opposed to left hemisphere damage. In their investigation, Ross and Long (1990) found that there were no differences between left hemisphere and right hemisphere damage patients on measures of depression. They concluded that lateralized differences do not exist for depression secondary to brain damage. Cullum and Bigler (1988) thus state, compellingly, that "the relationship between depressive symptoms and lesion parameters is highly complex and may be influenced by any number of procedural and intra-individual factors" (p. 333).

3.5. Premorbid Factors and the nature of TBI as determinants of emotional functioning after TBI

Yet another dimension to the debate is provided by scholars who contend that both premorbid factors and the nature of brain damage contribute to the observed post-injury responses. Teuber (1960, cited in Grafman et al., 1989) contends that pre-injury attitudes may exert a positive or a negative influence on post-injury losses and reactions, but these effects vary in accordance with lesion size and location. This view is corroborated by Lee et al. (1993), who investigated emotional reactions after brain damage. Lee et al. (1993) found that premorbid personality factors and hemispheric location of the lesion were both important determinants of emotional reactions after brain damage. These findings deviate from Lezak's (1983, 1995) strong emphasis on the role of hemispheric differences in the emotional reaction to the injury of people with TBI. This appears to be a difference of emphasis. While Lezak (1983, 1995) and other authors emphasize the role of the hemispheres in determining emotional functioning in the post-injury period, Lee et al. (1993) emphasize the role of both physical aspects of the injury, that is, size and location, and premorbid emotional function.

3.6. Towards a synthesis of the four perspectives

The foregoing review illustrates that the relationship between traumatic brain injury and emotional functioning is not linear but very complex. Four views exist, all of which are to a large extent cogent. Prigatano (1987) suggests that the personality and emotional changes observed after traumatic brain injury be conceptualised as three types:

1. those that flow directly from the neuropathological lesions and therefore can be described as neuropsychologically based personality disorders;

2. personality disturbances which are in reaction to the brain injury and associated failures in coping. These could generally be labelled as reactive (or secondary) personality problems; and,
3. those personality disorders that existed prior to the onset of the brain injury and are therefore long-term or characterological in nature.

Prigatano's categories represent a useful effort to neatly categorise the existing perspectives on traumatic brain injury and personality disorders (or emotional functioning). His categories are, however, not mutually exclusive. For instance, pre-existing personality problems classified in (3) above may make it difficult for the individual to cope with the brain injury, and negatively affect his/her post-traumatic reaction.

Compensation-litigation issues have also been found to play a role in the sequelae of mild head trauma (Diamond et al., 1988). These issues are regarded as important factors to consider when using a self-report inventory, as will be done in this study. It thus becomes imperative to generate a greater understanding of the impact of traumatic brain damage on emotional functioning, and of premorbid factors that may mediate this impact. This knowledge could assist victims of traumatic brain injuries and their families to cope better with the impact of these injuries.

In the light of the foregoing review, the broad aim of this study was to assess the nature of the association between TBI and perceived emotional functioning. The next chapter will discuss the methods that were used to assess the nature of the relationship between TBI and emotional functioning.

CHAPTER 4

METHODOLOGY

4.1 Aims of the study

Emanating from the current literature and as reflected in the previous chapter, the broad aim of this study was to assess the nature of the association between traumatic brain injury and perceived emotional functioning.

This aim was dis-aggregated into five specific aims, which were as follows:

4.1.1 To assess the premorbid emotional functioning of brain injured individuals;

4.1.2. To assess the brain injured individual's current emotional functioning;

4.1.3. To examine if there are patterns of changes in emotional functioning that can be linked to areas of brain injury;

4.1.4. To examine ways (if any) in which the brain damaged individual's premorbid emotional functioning structure has moderated the impact of brain injury;

4.1.5 To examine if there are discrepancies in the self-reports provided by brain injured individuals and the ratings by their care-givers.

4.2. Hypotheses

The major hypothesis advanced in this study was that amongst individuals diagnosed as brain injured there would be significant changes in perceived emotional functioning which were the result of their injury, and that certain aspects of premorbid emotional functioning would moderate the impact of brain damage.

The specific hypotheses were as follows:

4.2.1 The premorbid emotional functioning of traumatic brain injured individuals will be different from their current emotional functioning;

4.2.2. The traumatic brain damaged individual's current emotional functioning will reflect attributes that have survived the traumatic brain injury and/or attributes that have resulted from the brain injury;

4.2.3. Amongst individuals with traumatic brain damage, there will be patterns of emotional functioning that can be linked to areas of brain injury;

4.2.4. Amongst individuals with traumatic brain damage, there will be ways in which the brain damaged individual's premorbid emotional functioning has moderated the impact of brain injury;

4.2.5. There will be statistically significant discrepancies between the self-reports provided by brain injured individuals and the ratings by their care-givers.

4.3. Research Design

A retrospective design was used in this study. Intensive interviews were conducted with individuals who had (already) experienced traumatic brain injury (TBI), and who had been diagnosed as having frontal lobe damage. Their care-givers, that is, members of their immediate families were also interviewed.

4.4. Study Sample and Sampling Method

A total of 42 individuals participated in this study. Fourteen (14) of these were individuals diagnosed as having frontal lobe injuries, and the other 28 were the primary and secondary care-givers of these participants. Several inclusion criteria were employed in the selection of subjects. First, only male victims of TBI were included. The aim of this was to control for sex differences, a factor that has been found to have a significant effect on the emotional status of TBI patients (Burton & Volpe, 1988).

The second criterion was that the individuals with TBI must be between the ages of 18 and 50 years, as the literature shows that this age range is the highest risk group. The ages of the participants in the present study ranged from 19 to 37 with a mean age of 27. In terms of educational background, most of the participants had completed or almost completed high school, two had studied at tertiary institutions and one had attained a university degree. They were thus a fairly highly educated group.

The third inclusion criterion was that the traumatic event that caused the frontal lobe injuries must have occurred between two and four years before the onset of this study. This was due to the fact that the emotional and behavioural effects of TBI are not immediately observable after the injury. According to Odd and Humphrey (1980, cited in Burton & Volpe, 1988), the emotional and behavioural problems increase in the year after the injury, whereas the physical problems decrease. Furthermore, a decrease in social functioning is observable for as long as two years after the traumatic brain injury

(Odd & Humphrey, 1980; cited in Burton & Volpe, 1988). All the study participants satisfied this criterion, as their injuries had occurred in the period 1993-1997.

All the 14 individuals with TBI who participated in this study (100%) were unemployed at the time of the interviews. This is not uncommon, as several studies have found high unemployment rates among people with TBI. In their review of studies into vocational outcomes after TBI, Fraser and Baarslag-Benson (1994) found that unemployment rates among people with TBI were shown to vary between 50% and 80% . Harvey and Lewis (cited in Fraser & Baarslag, 1994) estimated the return to work rate of individuals with severe TBI to be between 20% and 30%.

For each person with frontal lobe injuries who participated in the study, two care-givers were interviewed to give their perspective on the person's premorbid and current personality functioning. This approach, known as triangulation, was used a method of improving the reliability of the data (P. Fridjhon, personal communication, 19 April 1996). Several criteria were used for the inclusion. The care-givers were classified into two categories, the primary and secondary care-givers. The primary care-givers were defined as the people who carried out the tasks of taking care of the individuals with TBI on a day to day basis. They might be mothers, wives and in some instances, sisters. The secondary care-givers were people who, like the primary care-givers, lived with the person with TBI, but unlike the primary care-givers, were not directly responsible for the day to day well being of the person with TBI. They could have played a supportive role in relation to the person with TBI, or to the primary care-givers. These could be fathers, siblings, or close relatives of the person with TBI.

These categories were developed notwithstanding the possible criticism that parents may tend to give a biased view of the brain injured child's condition (M. Lucas, 1996, personal communication, 18 April 1996). This potential shortcoming is, however, outweighed by the fact that parents have had more contact with the individual with TBI, and thus have more information about their functioning. Another inclusion criterion for the primary and secondary care-givers was that the sibling or spouse must have lived with the brain injured person for at least one year before the injury and for two years after the injury.

The participants were recruited from *Headway,* a support group for people with TBI, based at the Barney Hurwitz Institute in Johannesburg; and from Natalspruit Hospital in Katlehong. Convenience sampling (Bailey, 1982) was used to identify participants, and only those who satisfied the inclusion criteria were solicited. Although the settings from which the participants were recruited differed, this is not seen as likely to influence the findings of this study. This is because the most critical condition for their inclusion in the study was the fact that they had frontal lobe brain injuries. Informed consent was obtained from all the participants in this study (see Appendix I). Written permission to conduct the study at Natalspruit hospital was also obtained from the Senior Medical Superintendent of the hospital (see Appendix II).

4.5. Measuring Instruments

The current emotional functioning of individuals with TBI was assessed with the aid of an adapted version of the Katz Social Adjustment Scale, which was modified to be used as a self-report (see Appendix III). The original Katz Social Adjustment Scale was developed by Katz and Lyerly in 1963. This scale has strong psychometric qualities, including a concurrent discriminant validity of 0.79 and an internal consistency coefficient of 0.7 (Katz & Lyerly, 1963). According to Wade (1992) this scale measures changes in personality functioning that are observed in people with traumatic brain damage. The Katz Social Adjustment Scale uses a 4-point rating format, with response options ranging from "Almost Never" to "Almost Always".

The adapted version of the Katz Social Adjustment Scale consists of items extracted from the original scale, and places much emphasis on aspects of emotional functioning observed before and after the traumatic brain damage (see Appendix III). This version was used as a guide in interviews that were conducted with individuals with TBI. These individuals were asked to describe their premorbid and current emotional functioning, and to describe any changes that they felt had occurred post injury. This approach was used despite the caution sounded in the literature that TBI can compromise memory (Lezak, 1983, 1995). This was because not all individuals who sustain frontal lobe TBI lose memory or other aspects of cognitive functioning. For instance, Damasio (1985, cited in Yarnell & Rosie, 1990) found excellent cognitive functions in his patients with severe frontal lobe injuries.

Additional descriptions of the premorbid emotional functioning of individuals with TBI were further obtained by interviewing two of their primary care-givers, and asking them to explain how the brain injured individual was before the brain injury, and how s/he was functioning at the time of the interview. This was done with the aid of an adapted version of the Katz Social Adjustment Scale, which was modified to place greater emphasis on aspects of emotional functioning (see Appendix IV).

Both versions of the adapted Katz Social Adjustment Scale, that is, the patients' and relatives' versions, also consisted of an open ended section with general questions. The aim of these questions was to canvass the views of participants about other aspects of the emotional functioning of the person with TBI, which might not have been covered by the closed items on the scale. This was crucial since Lezak (1983, 1995) states, certain effects of brain damage are more often noticed by relatives (and co-workers) of the brain damaged individuals than by a medical or psychological examiner in a standard interview.

A pilot study was first undertaken to assess whether the research tools could elicit the data required. Two individuals with TBI were interviewed at the Casualty and Neurology Wards at Garankuwa Hospital, which is the teaching hospital of the Medical University of Southern Africa (Medunsa). Although the participants identified had suffered from TBI, their injuries had been acquired in the recent past, and did not satisfy the criterion that the injury must have occurred between 2-4 years prior to the interview. Their families were not traced. Furthermore, two individuals with TBI on the temporal and parietal lobe, who are members of Headway and their families, were also interviewed as part of the pilot study. The findings from these interviews were used to modify the Katz Social

Adjustment Scale to elicit the information required. These findings were, however, not included in the final data that was analyzed.

4.6. Procedure

All the respondents were interviewed by the investigator at their homes. In the case of Participants from *Headway*, the researcher attended their monthly meetings at Barney Hurwitz Hospital, and was given an opportunity by the group organisers to canvass for participants in the study. Volunteers for participation gave the researcher their addresses and telephone numbers, and appointments were subsequently arranged.

At the homes of the respondents, the medical records of the individuals with TBI were examined to verify whether they indeed had frontal lobe injuries. This was found to be the case for all of the 14 individuals who were interviewed. However, the medical records did not specify the exact site of the lesion, for instance, whether the injury was on the prefrontal or premotor cortex of the frontal lobe, or on the left or right hemisphere. The available information was, however, adequate for the purposes of the present study. The 14 individuals with frontal lobe injuries were interviewed separately from their care-givers. In fact, the care-givers completed the questionnaire themselves, and consulted the researcher when they needed clarity about certain questions. The individuals with TBI were interviewed by the researcher using an interview guide identical to the questionnaire that the care-givers were asked to complete. This was done to allow comparison between the views of the different family members and the person with TBI.

In the case of participants from Natalspruit Hospital, having obtained from the Senior Medical Superintendent permission to conduct the study, the researcher visited the Rehabilitation Ward at the hospital to review the medical records. This was done with the aim of examining whether there were individuals who met the criteria for participation in this study. The records showed that the individuals who met the criteria for participation in this study had been discharged from the hospital, and were based at their respective homes. These individuals were contacted and asked if they were willing to participate in the study. Those who volunteered, and their primary and their secondary care-givers, were interviewed by the researcher.

4.7. Translation of Measuring Instruments

The scales used in this study were originally written in English. This did not pose any difficulties for the participants recruited from Headway, as all of them were English speaking. However, for the rest of the participants, the questionnaires had to be translated into Isizulu and Sesotho, the two languages spoken by most of the participants. A process of back-translation was followed, as specified by Brislin (1986) and Retief (1988). The initial Katz Social Adjustment Scale was prepared in English. A bilingual person was asked translate the scales from English into IsiZulu and Sesotho. A second bilingual person was asked to translate the scales back into English, and the two English versions (the original and the translated versions) were compared and the necessary changes were made to the translated scales. As the researcher is fluent in both IsiZulu and Sesotho as well as English, the accuracy of the information about the subjects' responses was not compromised.

4.8. Data analysis

Non-parametric statistics was used to analyse the data. The Wilcoxon Signed Ranks (McCall, 1986) test was used to compute the scores of three groups of respondents on the various dimensions of emotional functioning. As McCall (1986) states, the Wilcoxon is a test of choice when working with two correlated samples. It is appropriate for use when the same variable is measured twice on the same subjects, for instance in a before and after study. The two sets of mesaures obtained in this way are correlated because they are made on the same subject (McCall, 1986). Two statistical packages namely, the SAS and BMDP were employed in the data analysis. The 0.05 level of significance was used as a cut off point (McCall, 1986; E. Viljoen, personal communication, 10 March, 1999).

The before and after self-ratings of the individuals with TBI and the before and after ratings by their primary and secondary care-givers were compared to examine if there were significant changes in the emotional functioning of the respondents with TBI that could be attributed to the brain injury. Also, the before and after ratings of these three groups of respondents were compared to assess if there were significant differences in the effects of brain injury on the participants which could be attributed to their premorbid emotional functioning.

In the next chapter, the results of this study are presented.

CHAPTER 5

RESULTS

5.1. Introduction

The findings of this study are presented in four sections. In the first section (5.2), the profile of the individuals with TBI is briefly revisited in order to place the results in their proper context. In the second section (5.3), the emotional functioning of the individuals with TBI is described in terms of the 13 dimensions of the Katz Social Adjustment Scale. On each dimension, the *premorbid* and *post-injury* functioning of the individuals with TBI is examined. A comparison of the self-reports of the respondents with TBI and the ratings of their emotional functioning by their primary and secondary care-givers, is presented. This section focuses on quantitative data. The third section (5.4) presents the views of the individuals with TBI, their primary care-givers and their secondary care-givers, with regard to other aspects of the emotional functioning of the person with TBI, which might not have been covered by the closed items of the adapted version of the Katz Social Adjustment Scale. This section focuses on qualitative data. The fourth and last section (5.5) addresses the findings as they pertain to the aims of the study.

5.2. Profile of the individuals with TBI

As pointed out in Chapter 4, the participants of this study were recruited from two different settings namely, Headway and Natalspruit Hospital in Katlehong. The participants from Headway were white and those from Katlehong were black (see Table 1). Their socio-economic circumstances also differed, with the respondents from the township emanating from more adverse conditions. However, despite these differences, the overarching similarity between all the 14 respondents was that they had frontal lobe brain injury, as indicated in their medical records. Thus the findings that are presented in this chapter cut across all other variables in the respondents' profile. They should thus be understood as primarily attributable to the TBI and not to social circumstances or other variables.

Table 1: Profile of the individuals with TBI

Type of Injury	**n**	**%**
Frontal lobe	14	100
Cause of TBI	**n**	**%**
Motor Vehicle Accidents	9	64.3
Motor Bike Accidents	2	14.3
Gunshot	1	7.1
Tripped and fell at work	1	7.1
Assault	1	7.1
Educational Level	**n**	**%**
Primary School (Grade1 – Std5)	1	7.1
High School (Std 6-Std 10)	9	64.3
Tertiary Institution (technikon/college/university)	4	28.6
Contact with researcher through	**n**	**%**
Headway (Barney Hurwitz)	7	50%
Natalspruit Hospital (Katlehong)	7	50%
Race	**n**	**%**
Black	7	50
White	7	50

5.3. The Emotional Functioning of Individuals with TBI

5.3.1 Depression/Catastrophic Reaction

With regard to *depression or catastrophic reaction,* there were statistically significant changes in the emotional functioning of the respondents with TBI in the post-injury period.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that in the period prior to their TBI, they had not manifested any major symptoms of depression or catastrophic reaction, but in the period following their injury they had started feeling very depressed. There were statistically significant differences between the premorbid and post-injury functioning on the dimension of depression and catastrophic reaction, as reported by the individuals with TBI ($p<0.039$) (see table 2).

Table 2 : Reports of *Depression and Catastrophic Reaction* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post injury periods

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample size	14	14	14	14	14	14
Mean	12.57	18.71	14.6	21.1	13.7	21.9
Standard Deviation	2.56	4.81	4.07	5.60	2.64	4.22
	$p < 0.0039$		$p < 0.0149$		$p < 0.0002$	

The primary care-givers also viewed the respondents with TBI as having changed considerably following their injury. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the depression and catastrophic reaction dimension, there were significant differences between their rating of pre-injury and post-injury functioning among the people with TBI ($p<0.0149$) (see table 2).

Similarly, the secondary care-givers reported major changes in the functioning of people with TBI following their injury. There were significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on the dimensions of depression and catastrophic reaction ($p<0.0002$) (see table 2).

Congruence between self reports and ratings by primary and secondary care-givers

On the dimension of depression and catastrophic reaction, there were significant differences in the self-reports by individuals with TBI and their ratings by their primary care-givers. With regard to premorbid functioning the individuals with TBI tended to report that they had not manifested major symptoms of depression, whereas their care-givers felt that even prior to their TBI they had exhibited features of depression. There were statistically significant differences between the reports of individuals with TBI about their premorbid functioning on the depression and catastrophic reaction scale and the ratings by primary care-givers ($p<0.0203$). Furthermore, with regard to post-injury functioning on the depression and catastrophic reaction dimension, there were also significant differences between the self reports by people with TBI and their primary care-givers ($p<0.0273$). This indicates that the respondents with TBI tended to under-report feelings of depression both before and after their injuries, while their primary care-givers were more outspoken about these.

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers on the dimension of depression and catastrophic reaction, there were no significant differences in their views of the premorbid functioning of the person with TBI ($p>0.2588$). However, there were significant differences in the reports of these two groups of respondents with regard to the post-injury functioning of the person with TBI ($p<0.0078$). The respondents with TBI tended to underplay the feelings of depression they experienced following their injury, while their secondary care-givers tended to disclose these.

When comparing the views of the primary and secondary care-givers on the dimension of depression and catastrophic reaction, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning ($p>0.6250$) and post-injury functioning ($p>0.3394$).

5.3.2. Emotional Lability

With regard to the dimension of *emotional lability,* there were significant changes in the emotional functioning of individuals with TBI following their injury. There was consensus between the individuals with TBI, their primary care–givers and their secondary care-givers, that there had been changes in the emotional state of the individual with TBI, which had been observed after the injury.

Premorbid Functioning vs Post-injury functioning

The majority of respondents with TBI indicated that prior to their injury, they had never been emotionally labile, that is, they had never had sudden mood changes without reason. However, they reported that following their injury, they had experienced considerable emotional lability. There were statistically significant differences between the premorbid and post-injury functioning on the dimension of emotional lability, as reported by the individuals with TBI ($p<0.0078$) (see table 3).

Table 3 : **Reports of *Emotional Lability* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post injury periods**

	Individuals with TBI		Primary Care-givers		Secondary Care-givers	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample size	14	14	14	14	14	14
Mean	7.64	11.7	8.36	13.21	8.86	14.29
Standard Deviation	2.02	4.59	2.34	3.33	2.74	3.62
	P <0.0078		*p<0.0020*		*p< 0.0005*	

The primary care-givers of the individuals with TBI also reported significant changes in the dimension of emotional lability among these individuals. There were statistically significant differences between their ratings by primary care-givers of the pre-injury and the post-injury functioning on the dimension of emotional lability (p<0.0020) (see table 3). The primary care-givers saw the respondents with TBI as having changed considerably following their injury. The secondary care-givers of individuals with TBI also reported significant differences between the pre-injury and post-injury functioning of these individuals (p<0.0005) (see table 3). This denotes that the secondary care-givers also observed a significant increase in emotional lability among people with TBI following their injury.

Congruence between self reports and ratings by primary and secondary care-givers

On the dimension of emotional lability, there was consistency in the self-reports by individuals with TBI and the ratings by their primary care-givers. With regard to premorbid functioning, both the respondents with TBI and their primary care-givers reported that emotional lability had not been a major problem for the people with TBI.

There were no significant differences between the self-reports by the respondents with TBI and their primary care-givers (p> 0.2188). With regard to post-injury functioning on the emotional lability dimension, there also were no significant differences between the self-reports by people with TBI and the ratings by their primary care-givers on the (p>0.0679). This indicates that the respondents with TBI and their primary care-givers were in consensus that emotional lability became a difficulty only after TBI.

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers on the dimension of emotional lability, there were no significant differences in their views of the premorbid functioning of the person with TBI (p>0.1875). Also, there were no significant differences in the reports of these two groups of respondents with regard to the post-injury functioning of the person with TBI (p>0.0741). Both the respondents with TBI and their secondary care-givers perceived emotional lability as a difficulty that became enhanced in the period following TBI.

When comparing the views of the primary care-givers with those of the secondary care-givers on the dimension of emotional lability, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning (*p>0.4219*) and post-injury functioning (*p>0.1479*).

5.3.3. Anger

On the dimension of *anger*, there were no changes in the emotional functioning of individuals with TBI. There was consensus between the respondents with TBI and their primary care-givers that anger had not been a major problem, both before and after the TBI. However, the secondary care-givers of individuals with TBI reported that while anger had not been a problem prior to the TBI, it had become a difficulty in the post-injury period. There were statistically significant differences in the views of the three groups of respondents. In this study, in instances where there are statistically significant differences between the views of the three groups of respondents, the views of the primary care-givers are regarded as carrying more weight. Primary care-givers are considered to have greater insight into the emotional functioning of the individuals with TBI, having lived with them both before and after the TBI. Hence changes are viewed as having not occurred in the emotional functioning of individuals with TBI on the dimension of anger

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that in both the period prior to their TBI and the post-injury period, they had never had a problem dealing with their anger. There were no statistically significant differences in the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of anger ($p>0.1250$) (see table 4).

Table 4 : **Reports of *Anger* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post injury periods**

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample size	14	14	14	14	14	14
Mean	3.14	3.57	4.00	5.35	3.71	5.07
Standard Deviation	0.53	1.15	1.79	2.34	2.74	3.63
	p>0.1250		*p >0.0642*		*p< 0.0451*	

The primary care-givers also did not report any major changes on the dimension of anger on the part of respondents with TBI in the post-injury period. Thus, when the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of anger, there were no significant differences between their rating of the pre-injury and post-injury functioning of people with TBI ($p>0.0642$) (see table 4).

However, the secondary care-givers reported observing major changes in the functioning of people with TBI in the period following their injury. There were significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on the dimension of anger ($p<0.0451$) (see table 4).

Congruence between self reports and ratings by primary and secondary care-givers

On the dimension of anger, there were areas of consistency and inconsistency between the self-reports by individuals with TBI and the ratings by their primary caregivers. In terms of premorbid functioning, both the individuals with TBI and their primary care-givers reported these individuals did not have difficulty dealing with their anger. There were no statistically significant differences between the self-reports of individuals with TBI and the ratings by their primary care-givers with regard to their premorbid functioning on the anger dimension ($p>0.3750$). However, with regard to post-injury functioning on the dimension of anger, the primary care-givers reported that the respondents with TBI began to have difficulty dealing with their anger. The respondents with TBI on the hand, tended to under-report this. There were statistically significant differences between the self reports by people with TBI and the rating by their primary care-givers with regard to post-injury functioning on the dimension of anger ($p<0.0020$). This finding requires further explanation. While the primary care-givers had initially reported that they had not observed major differences between the pre-injury and post-injury functioning of individuals with TBI on the dimension of anger, they were significantly more likely to report anger in the post-injury period than individuals with TBI themselves.

There were also areas of consistency and inconsistency between the self-reports by individuals with TBI and the rating by their secondary caregivers When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of anger, there were no significant differences in their views ($p>0.3750$). Both groups of respondents concurred that the people with TBI did not have major problems dealing with anger in the period preceding their injury. However, in terms of post-injury functioning on the dimension of anger, the secondary care-givers reported that the individuals with TBI had started having difficulty dealing with their anger, while these individuals tended to underplay this occurrence. There were statistically significant differences in the self-reports of people with TBI and their ratings by the secondary care-givers in the post-injury period ($p<0.0078$). It will be recalled that the secondary care-givers had from the outset reported that they had observed major differences between the pre-injury and post-injury functioning of individuals with TBI on the dimension of anger.

When comparing the views of the primary and secondary care-givers on the dimension of anger, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning ($p>0.3125$) and post-injury functioning ($p>0.3125$).

5.3.4. Irritability

On the dimension of *irritability,* there were changes in the emotional functioning of individuals with TBI. There was consensus between the individuals with TBI , their primary care-givers and their secondary care-givers that they had observed an increase in irritability in the post-injury period.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that prior to their TBI, they had never experienced major feelings of irritability, but stated that these feelings had increased in the post-injury period. There were statistically significant differences in the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of irritability ($p<0.0234$) (see table 5).

Table 5 : **Reports of *Irritability* by individuals with TBI, their primary care-givers and their secondary caregivers in the pre-injury and post-injury periods**

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample Size	14	14	14	14	14	14
Mean	2.50	3.86	3.14	5.07	3.35	5.29
Standard Deviation	1.09	1.75	1.09	1.43	1.15	1.81
	$p < 0.0234$		$p < 0.0010$		$p < 0.0024$	

The primary care-givers also reported significant changes on the dimension of irritability on the part of respondents with TBI following their injury. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of irritability, there were significant differences between their rating of the pre-injury and post-injury functioning of people with TBI on the irritability dimension ($p<0.0010$) (see table 5).

Similarly, the secondary care-givers reported major changes in the functioning of people with TBI following their injury on the dimension of irritability. There were significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on this dimensions ($p<0.0024$) (see table 5).

Congruence between self reports and ratings by primary and secondary care-givers

On the dimension of irritability, there was consistency between the self-reports by individuals with TBI and their primary caregivers. In terms of premorbid functioning, both the individuals with TBI and their primary care-givers reported these individuals had not been irritable. There were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers with regard to their premorbid functioning on the irritability dimension ($p>0.0547$). With regard to post-injury functioning on the dimension of irritability, both the respondents with TBI and the primary care-givers reported that the respondents with TBI had become more irritable following their injury. There were no significant differences between the self reports by people with TBI and the rating by their primary care-givers with regard to post-injury functioning on the dimension of irritability ($p>0.0718$).

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of irritability, there were no significant differences in their views ($p>0.0536$). Both groups of respondents concurred that the people with TBI were not irritable in the period preceding their injury. Furthermore, in terms of post-injury functioning on the dimension of irritability, both individuals with TBI and the secondary care-givers agreed that the individuals with TBI had become irritable following their injury. There were no significant differences in the self-reports of people with TBI and their ratings by the secondary care-givers ($p>0.0732$).

When comparing the views of the primary and secondary care-givers on the dimension of irritability, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning ($p>0.5312$) and post-injury functioning ($p>0.8438$). Both the primary and secondary care-givers believed that the individuals with TBI had not been irritable prior to their TBI but had become highly irritable following their TBI.

5.3.5. Aggression

On the dimension of *aggression,* there were no changes in the emotional functioning of individuals with TBI in the period following their TBI. The individuals with TBI, their primary care-givers, and their secondary care-givers, all agreed that these individuals had not exhibited aggressive behavior both before and after TBI.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that they had not been aggressive, both in the premorbid and post-injury period. There were no statistically significant differences in the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of aggression (p>0.3750) (see table 6).

Table 6 : Reports of *Aggression* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post-injury periods

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample Size	14	14	14	14	14	14
Mean	8.71	7.14	9.000	8.07	8.86	7.71
Standard Deviation	4.65	2.35	5.67	2.70	5.69	1.73
	p> 0.3750		*p> 0.9526*		*p> 0.5071*	

The primary care-givers of individuals with TBI did not report significant changes on the dimension of aggression following the TBI. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of aggression, there were no significant differences between their rating of the pre-injury and post-injury functioning of people with TBI on the aggression dimension (p>0.9526) (see table 6).

Similarly, the secondary care-givers did not report major changes in the functioning of people with TBI following their injury on the dimension of aggression. There were no significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on this dimension (p>0.5071) (see table 6).

Congruence between self reports and ratings by primary and secondary care-givers

On the dimension of aggression, there was consistency between the self-reports by individuals with TBI and their primary caregivers. In terms of premorbid functioning, both the individuals with TBI and their primary care-givers reported these individuals had not been aggressive. With regard to premorbid functioning on the dimension of aggression, there were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers (p>0.9062). With regard to post-injury functioning on this dimension, both the individuals with TBI and the primary care-givers reported that these individuals had not become aggressive following their injury. There were no significant differences between the self reports by people with TBI and the rating by their primary care-givers with regard to post-injury functioning on the dimension of aggression (p>0.2575).

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of aggression, there were no significant differences in their views (p>0.8125). Both groups of respondents concurred that the people with TBI were not aggressive in the period preceding their injury. Furthermore, in terms of post-injury functioning on the dimension of aggression, both individuals with TBI and their secondary care-givers reported that the individuals with TBI had not become aggressive following their injury. There were no significant differences in the self ratings of people with TBI and their ratings by the secondary care-givers with regard to post-injury functioning on the dimension of aggression (p>0.1340).

When comparing the views of the primary and secondary care-givers on the dimension of irritability, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning (p>0.5000) and post-injury functioning (p>0.5000). Both the primary and secondary care-givers believed that the individuals with TBI had not been aggressive both prior to the TBI and after sustaining the TBI.

5.3.6. Euphoria

On the dimension of *euphoria,* there were no changes in the emotional functioning of individuals with TBI in the period following their injury. There was consensus between the individuals with TBI, their primary care-givers and secondary care-givers, that these individuals had not exhibited euphoric behavior both prior to their TBI and in the period following their injury.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that they had never been euphoric, both in the premorbid and post-injury period. There were no statistically significant differences in the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of euphoria (p>0.1094 (see table 7).

Table 7 : **Reports of *Euphoria* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post-injury periods**

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample size	14	14	14	14	14	14
Mean	4.00	4.79	3.71	4.07	4.14	4.21
Standard Deviation	2.48	2.22	2.33	2.16	2.41	1.80
	p> 0.1094		*p> 0.7188*		*p> 0.7734*	

The primary care-givers of individuals with TBI did not significant major changes on the dimension of euphoria following the TBI. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of euphoria, there were no significant differences between their rating of the pre-injury and post-injury functioning of people with TBI on the euphoria dimension (p>0.7188) (see table 7).

Similarly, the secondary care-givers did not report major changes in the functioning of people with TBI following their injury on the dimension of euphoria. There were no significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on this dimension (p>0.7734) (see table 7).

Congruence between self-reports and ratings by primary and secondary care-givers

On the dimension of euphoria, there was consistency between the self-reports by individuals with TBI and their primary caregivers. In terms of premorbid functioning, both the individuals with TBI and their primary care-givers reported these individuals had never manifested features of euphoria. There were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers on the dimension of euphoria in the pre-injury period (p>0.8125). With regard to post-injury functioning on this dimension, both the individuals with TBI and the primary care-givers reported that these individuals had not become euphoric following their injury. There were no significant differences between the self-reports by people with TBI and the rating by their primary care-givers with regard to post-injury functioning on the dimension of euphoria (p>0.3752).

When comparing the self-reports of the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of euphoria, there were no significant differences in their views (p>0.9609). Both groups of respondents concurred that the people with TBI were not euphoric in the period preceding their injury. Furthermore, in terms of post-injury functioning on the dimension of euphoria, both individuals with TBI and their secondary care-givers reported that the individuals with TBI had not become euphoric following their injury. There were no significant differences in the self-reports of people with TBI and their ratings by the secondary care-givers with regard to post-injury functioning on the dimension of euphoria (p>0.6528).

When comparing the views of the primary and secondary care-givers on the dimension of irritability, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning (p>0.2500) and post-injury functioning (p>0.8906). Both the primary and secondary care-givers believed that the individuals with TBI had not been euphoric both prior to the TBI and after sustaining the injuries.

5.3.7. Apathy

On the dimension of *apathy*, there were changes in the emotional functioning of the respondents with TBI. There was consensus among the individuals with TBI and their primary and secondary care-givers that these individuals with TBI had not shown features of apathy in the period preceding their TBI, but had become apathetic in the period following their injury.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that they had never shown features of apathy in the period preceding their injury. However, they stated that they had manifested behaviour suggesting the onset of apathy in the post-injury period. There were statistically significant differences in the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of apathy ($p<0.0156$) (see table 8).

Table 8 : Reports of *Apathy* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post injury periods

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample Size	14	14	14	14	14	14
Mean	3.14	5.50	3.26	6.71	3.57	7.14
Standard Deviation	0.36	2.82	0.61	2.46	1.16	2.38
	P< 0.0156		*p< 0.0010*		*p< 0.0010*	

The primary care-givers of individuals with TBI also reported significant changes on the dimension of apathy following the TBI. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of apathy, there were significant differences between their rating of the pre-injury and post-injury functioning of people with TBI ($p<0.0010$) (see table 8).

Similarly, the secondary care-givers stated that there were significant changes in the functioning of people with TBI following their injury on the dimension of apathy. There were significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on this dimension ($p<0.0010$) (see table 8).

Congruence between self reports and ratings by primary and secondary care-givers

On the dimension of apathy, there was consistency between the self-reports by individuals with TBI and their primary caregivers. In terms of premorbid functioning, both the individuals with TBI and their primary care-givers agreed that these individuals had never manifested features of apathy. There were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers on the dimension of apathy in the pre-injury period ($p>0.7500$). Furthermore, with regard to post-injury functioning on this dimension, both the individuals with TBI and the primary care-givers reported that these individuals had become apathetic following their injury. There were no significant differences between the self-reports by people with TBI and the rating by their primary care-givers with regard to post-injury functioning on the dimension of apathy ($p>0.3752$).

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of apathy, there were no significant differences in their views ($p>0.3750$). Both groups of respondents concurred that the people with TBI were not apathetic in the period preceding their injury. Furthermore, in terms of post-injury functioning on the dimension of apathy, both individuals with TBI and their secondary care-givers reported that the individuals with TBI had changed and become apathetic following their injury. There were no significant differences in the self reports of people with TBI and their ratings by the secondary care-givers with regard to post-injury functioning on the dimension of apathy (p>0.0589).

When comparing the views of the primary and secondary care-givers on the dimension of apathy, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning (p>0.7500) and post-injury functioning (p>0.3750). Both the primary and secondary care-givers believed that the individuals with TBI had not manifested symptoms of apathy prior to the TBI, but had become apathetic after sustaining TBI.

5.3.8. Suspicion (paranoia)/Persecutory anxiety

On the dimension of *suspicion (paranoia) or persecutory anxiety,* there were significant changes in the emotional functioning of the respondents with TBI following their injury. The individuals with TBI and their secondary care-givers reported that these individuals had become more suspicious or paranoid in the period following their injury. The primary care-givers, by contrast, did not report major changes in the functioning of individuals with TBI on the suspicion dimension. However, the differences between the views of the three groups of respondents were not statistically significant. Stated differently, the primary care-givers did not disagree vehemently with the views expressed by the individuals with TBI and their secondary care-givers.

Had the differences between the three groups of respondents been statistically significant, changes would be regarded as not having occurred on the dimension of suspicion (paranoia)/persecutory anxiety. As already pointed out in the section on *Anger* (5.3.3), in instances where there are statistically significant differences between the views of the three groups of respondents, the views of the primary care-givers are regarded as carrying more weight. Primary care-givers are considered to have greater insight into the emotional functioning of the individuals with TBI, having lived with them both before and after the TBI.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that they had never shown features of suspicion or paranoia in the period preceding their injury. However, they stated that they had become more suspicious and paranoid in the post-injury period. There were statistically significant differences in the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of suspicion (paranoia) ($p<0.0326$)
(see table 9).

Table 9 : **Self reports of *Suspicion (Paranoia)* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post injury periods**

	Individual with TBI		**Primary Care-giver**		**Secondary Care-giver**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample size	14	14	14	14	14	14
Mean	11.21	14.86	11.42	13.14	11.21	13.93
Standard Deviation	1.89	5.56	1.65	4.69	1.31	3.67
	p< 0.0326		*p> 0.1022*		*p< 0.0096*	

The primary care-givers of individuals with TBI did not report major changes on the dimension of suspicion (paranoia) following the TBI. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of suspicion, there were no significant differences between their rating of the pre-injury and post-injury functioning of people with TBI ($p<0.1022$) (see table 9).

In contrast to the primary care-givers, the secondary care-givers reported that there were major changes in the functioning of people with TBI on the dimension of suspicion following their injury. There were significant differences between the pre-injury ad post-injury ratings by the secondary care-givers of the individuals with TBI on this dimension ($p<0.0096$) (see table 9).

Congruence between self reports and ratings by primary and secondary care-givers

With regard to emotional functioning on the dimension of suspicion (paranoia) in the pre-injury period, there were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers ($p>0.5866$). Furthermore, regarding post-injury functioning on the suspicion dimension, there were no significant differences between the self reports by people with TBI and the rating by their primary care-givers ($p>0.4539$). The individuals with TBI viewed themselves as having become more suspicious or paranoid following their TBI, but their primary care-givers did not report a major increase in suspiciousness or paranoia. The inconsistency between the views of the two respondents is, however, not statistically significant.

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of suspicion, there were no significant differences in their views ($p>0.7596$). Both groups of respondents concurred that the people with TBI were not suspicious in the period preceding their injury. In terms of post-injury functioning on the dimension of suspicion, both individuals with TBI and their secondary care-givers reported that the individuals with TBI had changed and become suspicious and paranoid following their injury. There were no significant differences in the self reports of people with TBI and their ratings by the secondary care-givers with regard to post-injury functioning on the dimension of suspicion ($p>0.8746$).

When comparing the views of the primary and secondary care-givers on the dimension of suspicion (paranoia), there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning (p>0.5000) and post-injury functioning (p>0.7985). Both the primary and secondary care-givers believed that the individuals with TBI had not manifested symptoms of suspicion prior to the TBI. With regard to the period following TBI, the secondary care-givers believed that the individuals with TBI had become suspicious and paranoid, but the primary care-givers did not report any significant increase in paranoia and suspicion. The difference between the views of the two groups of care-givers is, however, not statistically significant (p>0.7985).

5.3.9. Loneliness and Social Withdrawal

On the dimension of *loneliness and social withdrawal*, there were changes in the emotional functioning of individuals with TBI, following their injury. The respondents with TBI, their primary care-givers, and their secondary care-givers all agreed that the individuals with TBI had not felt lonely in the period prior to their injuries, but had felt lonely after sustaining their injuries.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that they had never felt lonely or manifested symptoms of social withdrawal in the period preceding their injury. However, they reported that they had started feeling lonely and socially withdrawn in the post-injury period. There were statistically significant differences between the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of loneliness and social withdrawal (p<0.0005) (see table 10).

Table 10 : **Reports of *Loneliness and Social Withdrawal* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post injury periods**

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample size	14	14	14	14	14	14
Mean	5.43	9.57	11.42	13.42	6.57	9.86
Standard Deviation	0.85	4.43	1.65	4.69	2.03	2.79
	$p<0.0005$		$p<0.0010$		$p<0.0020$	

The primary care-givers of individuals with TBI also reported major changes on the dimension of loneliness and social withdrawal following the TBI. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of loneliness, there were significant differences between their rating of the pre-injury and the post-injury functioning of people with TBI ($p<0.0010$) (see table 10). As was the case with the primary care-givers, the secondary care-givers reported that there were major changes in the functioning of people with TBI on the dimension of loneliness and social withdrawal following their injury. There were significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on this dimension ($p<0.0020$) (see table 10).

Congruence between self reports and ratings by primary and secondary care-givers

With regard to emotional functioning on the dimension of loneliness and social withdrawal in the pre-injury period, there were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers (p>0.0625). Furthermore, regarding post-injury functioning on the loneliness and social withdrawal dimension, there were no significant differences between the self reports by people with TBI and the rating by their primary care-givers (p>0.4787). The individuals with TBI viewed themselves as having felt more lonely and socially withdrawn following their TBI, and their primary care-givers viewed this in the same light. There was consistency between the views of the two groups of respondents.

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of loneliness and withdrawal, there were no significant differences in their views (p>0.1022). Both groups of respondents concurred that the people with TBI did not manifest features of loneliness in the period preceding their injury. Furthermore, in terms of post-injury functioning on the dimension of loneliness, both individuals with TBI and their secondary care-givers reported that the individuals with TBI had changed and started feeling lonely and socially withdrawn following their injury. There were no significant differences in the self reports of people with TBI and their ratings by the secondary care-givers with regard to post-injury functioning on the dimension of loneliness (p>0.5807).

When comparing the views of the primary and secondary care-givers on the dimension of loneliness and social withdrawal, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning (p>0.7188) and post-injury functioning (p>0.7172). Both the primary and secondary care-givers believed that the individuals with TBI had not manifested symptoms of loneliness and social withdrawal prior to the TBI, but had become lonely and socially withdrawn after sustaining TBI.

5.3.10. Disinhibition and Hostility to people

On the dimension of *disinhibition and hostility to people*, there were no changes in the emotional functioning of individuals with TBI in the post-injury period. There was consensus between the individuals with TBI, their primary care-givers and their secondary care-givers, that these individuals had not manifested features of disinhibition and hostility to people, both prior to their TBI and after their injuries.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that they had never shown features of disinhibition and hostility to people, both in the period preceding their injury and in the post-injury period. There were no statistically significant differences between the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of loneliness and social withdrawal (p>0.1250 (see table 11).

Table 11 : Reports of *Disinhibition and Hostility to people* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post injury periods

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before Injury	**After Injury**	**Before Injury**	**After Injury**	**Before Injury**	**After Injury**
Sample size	14	14	14	14	14	14
Mean	5.14	6.21	6.50	7.64	6.50	7.71
Standard Deviation	2.28	3.01	2.50	3.29	2.44	2.89
	p > 0.1250		*p>0.3680*		*p> 0.2111*	

The primary care-givers of individuals with TBI did not report any significant changes on the dimension of disinhibition and hostility to people following the TBI. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of disinhibition and hostility to people, there were no significant differences between their rating of the pre-injury and the post-injury functioning of people with TBI ($p>0.3680$).

As was the case with the primary care-givers, the secondary care-givers did not report any major changes in the functioning of people with TBI on the dimension of disinhibition and hostility to people following their injury. There were no significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on this dimension ($p>0.2111$).

Congruence between self reports and ratings by primary and secondary care-givers

With regard to emotional functioning on the dimension of disinhibition and hostility to people in the pre-injury period, there were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers ($p>0.1250$). Also, regarding post-injury functioning on this dimension, there were no significant differences between the self reports by people with TBI and the ratings by their primary care-givers ($p>0.0731$). The individuals with TBI asserted that they had not become more disinhibited or hostile to people following their TBI, and their primary care-givers concurred with them.

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of disinhibition and hostility to people, there were no significant differences in their views ($p>0.1376$). Both groups of respondents concurred that the people with TBI did not behave as if they were disinhibited or hostile to people in the period preceding their injury. Furthermore, in terms of post-injury functioning on this dimension, both individuals with TBI and their secondary care-givers reported that the individuals with TBI had not manifested any features of disinhibition and hostility to people following their injury. There were no significant differences in the self reports of people with TBI and the ratings by the secondary care-givers with regard to post-injury functioning on the dimension of disinhibition and hostility to people ($p>0.1559$).

When comparing the views of the primary and secondary care-givers on the dimension of disinhibition and hostility to people, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning ($p>1.0000$) and post-injury functioning ($p>1.0000$). Both the primary and secondary care-givers believed that the individuals with TBI had not manifested symptoms of disinhibition and hostility to people both prior to sustaining TBI, and in the post-injury period.

5.3.11. Lack of Concern/Diminished Anxiety/ Egocentricity

On the dimension of *lack of concern or diminished anxiety (egocentricity)*, there were no changes in the emotional responses of individuals with TBI in the period following their injuries. There was consensus among the individuals with TBI and their primary care-givers that the respondents with TBI had not manifested any lack of concern, diminished anxiety and egocentricity both in the pre-injury and post-injury periods. The secondary care-givers concurred that the respondents with TBI had not manifested lack of concern in the pre-injury period, but stated that in the post-injury period these individuals had become less concerned about other people. However, the differences between the views of the people with TBI and the primary care-givers on the one hand, and the secondary care-givers on the other, were not statistically significant. Had these differences been significant, the views of the primary care-givers and individuals with TBI would still be regarded as carrying more weight.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that they had never manifested a lack of concern or diminished anxiety, both in the period preceding their injury and in the post-injury period. There were no statistically significant differences between the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of lack of concern or diminished anxiety (p>1.0000) (see table 12).

Table 12 : **Reports of *Lack of Concern/Diminished Anxiety/Egocentricity* by individuals with TBI, their primary care-givers and their secondary care-givers**

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**After TBI**	**Before** TBI
Sample size	14	14	14	14	14	14
Mean	4.36	4.23	4.43	5.07	4.57	5.57
Standard Deviation	2.40	2.05	1.69	2.46	2.24	2.44
	p> 1.0000		*p> 0.0625*		*p < 0.0156*	

The primary care-givers of individuals with TBI did not report any significant changes on the dimension of lack of concern or diminished anxiety following the TBI. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of lack of concern or diminished anxiety, there were no significant differences between their rating of the pre-injury and the post-injury functioning of people with TBI (p>0.0625) (see table 12).

Unlike the primary care-givers, the secondary care-givers did report significant changes in the functioning of people with TBI on the dimension of lack of concern or diminished anxiety following their injury. There were significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on this dimension ($p<0.0156$) (see table 12).

Congruence between self reports and ratings by primary and secondary care-givers

With regard to emotional functioning on the dimension of lack of concern or diminished anxiety in the pre-injury period, there were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers ($p>0.8281$). Also, regarding post-injury functioning on this dimension, there were no significant differences between the self reports by people with TBI and the rating by their primary care-givers ($p>0.2374$). The individuals with TBI asserted that they had not become less concerned about other people in the period following their TBI, and their primary care-givers concurred with them.

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of lack of concern and diminished anxiety, there were no significant differences in their views ($p>0.7209$). Both groups of respondents concurred that the people with TBI did not behave as if they were less concerned about other people, in the period preceding their injury. However, in terms of post-injury functioning on this dimension, there were differences between the views of individuals with TBI and their secondary care-givers. Whereas the individuals with reported that they had not manifested any features of lack of concern or diminished anxiety following their injury, their secondary care-givers mentioned that these individuals had become less concerned about other people. The differences between the self reports of people with TBI and the ratings by the secondary care-givers with regard to post-injury functioning on the dimension of lack of concern or diminished anxiety were, however, not statistically significant ($p>0.0799$).

When comparing the views of the primary and secondary care-givers on the dimension of lack of concern and diminished anxiety, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning (p>0.8750) and post-injury functioning (p>0.2137). Both the primary and secondary care-givers believed that the individuals with TBI had not manifested any symptoms of lack of concern or diminished anxiety to people prior to sustaining TBI. Also, while the secondary care-givers believed that the respondents with TBI had manifested lack of concern and diminished anxiety following their injury, the differences between this view and that of the primary care-givers is not statistically significant.

5.3.12. Strange Behaviour

On the dimension of *strange behavior* there were no changes in the emotional functioning of individuals with TBI following their injury. There was agreement among the individuals with TBI, their primary care-givers and secondary care-givers, that the respondents with TBI had not manifested any strange behavior, both before and after the injury.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that they had never shown features of strange behaviour, both in the period preceding their injury and in the post-injury period. There were no statistically significant differences between the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of strange behaviour (p>0.1250) (see table 13).

Table 13 : Reports of Strange Behaviour by individuals with TBI, their primary care-givers, and their secondary care-givers in the pre-injury and post injury periods

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample size	14	14	14	14	14	14
Mean	4.64	5.64	4.36	4.86	4.57	5.57
Standard Deviation	1.87	2.70	0.63	1.17	2.24	2.44
	$p > 0.1250$		$p > 0.2812$		$p > 0.2812$	

The primary care-givers of individuals with TBI did not report any significant changes on the dimension of strange behavior following the TBI. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of strange behaviour, there were no significant differences between their rating of the pre-injury and the post-injury functioning of people with TBI ($p>0.2812$) (see table 13).

As was the case with the primary care-givers, the secondary care-givers did not report any major changes in the functioning of people with TBI on the dimension of strange behaviour. There were no significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on this dimension ($p>0.2812$) (see table 13).

Congruence between self reports and ratings by primary and secondary care-givers

With regard to emotional functioning on the dimension of strange behaviour in the pre-injury period, there were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers (p>1.0000). Also, regarding post-injury functioning on this dimension, there were no significant differences between the self reports by people with TBI and the rating by their primary care-givers (p>0.3828). The individuals with TBI asserted that they had not manifested any strange behaviour both before and after their TBI, and their primary care-givers concurred with them.

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of strange behaviour, there were no significant differences in their views (p>1.0000). Both groups of respondents concurred that the people with TBI did not exhibit any strange behaviour in the period preceding their injury. Furthermore, in terms of post-injury functioning on this dimension, both individuals with TBI and their secondary care-givers reported that the individuals with TBI had not manifested any strange behaviour following their injury. There were no significant differences in the self reports of people with TBI and their ratings by the secondary care-givers with regard to post-injury functioning on the dimension of strange behaviour (p>0.1250).

When comparing the views of the primary and secondary care-givers on the dimension of strange behaviour, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning (p>0.6250) and post-injury functioning (p>0.3594). Both the primary and secondary care-givers believed that the individuals with TBI had not manifested symptoms of strange behaviour both prior to sustaining TBI, and in the post-injury period.

5.3.13. Psychiatric Symptoms

On the dimension *psychiatric symptoms*, there were changes in the emotional functioning of individuals with TBI following their injuries. There was agreement among the individuals with TBI, their primary care-givers and secondary care-givers, that the respondents with TBI had not manifested symptoms of any psychiatric condition before sustaining the TBI, but had exhibited these symptoms in the period following their injury.

Premorbid Functioning vs Post-injury functioning

Most respondents with TBI reported that they had not manifested any symptoms of a psychiatric disorder in the period preceding their injury. However, they mentioned that people had started remarking that they were exhibiting symptoms of psychiatric illness in the post-injury period (e.g. talking alone). There were statistically significant differences between the reports of individuals with TBI about their premorbid and post-injury functioning on the dimension of psychiatric symptoms ($p<0.0153$) (see table 14).

Table 14 : Reports of *Psychiatric Symptoms* by individuals with TBI, their primary care-givers and their secondary care-givers in the pre-injury and post-injury periods

	Individuals with TBI		**Primary Care-givers**		**Secondary Care-givers**	
	Before TBI	**After TBI**	**Before TBI**	**After TBI**	**Before TBI**	**After TBI**
Sample size	14	14	14	14	14	14
Mean	6.57	9.21	6.21	8.64	6.43	8.57
Standard Deviation	0.85	4.15	0.58	2.82	0.94	3.16
	$p< 0.0153$		$p<0.0010$		$p< 0.0078$	

The primary care-givers of individuals with TBI also reported significant changes on the dimension of psychiatric symptoms following the TBI. When the primary care-givers were asked to rate the functioning of the individuals with TBI on the dimension of psychiatric symptoms, there were significant differences between their rating of the pre-injury and the post-injury functioning of people with TBI ($p<0.0010$).). This implies that the respondents with TBI had started manifesting symptoms of psychiatric disorders in the period following their TBI.

As was the case with the primary care-givers, the secondary care-givers did report major changes in the functioning of people with TBI on the dimension of psychiatric symptoms. There were significant differences between the pre-injury and post-injury ratings by the secondary care-givers of the individuals with TBI on this dimension ($p<0.0078$).

Congruence between self reports and ratings by primary and secondary care-givers

With regard to emotional functioning on the dimension of psychiatric symptoms in the pre-injury period, there were no statistically significant differences between the reports of individuals with TBI and the ratings by their primary care-givers ($p>0.1250$). Also, regarding post-injury functioning on this dimension, there were no significant differences between the self reports by people with TBI and the rating by their primary care-givers ($p>0.9031$). The individuals with TBI stated that they had not manifested any psychiatric symptoms before their TBI, but conceded that other people had observed that some of their behaviours had suggested the presence of psychiatric symptoms in the post-injury period, for instance, a tendency to talk alone. Their primary care-givers shared this view.

When comparing the self-reports by the individuals with TBI and the ratings by their secondary care-givers with regard to premorbid functioning on the dimension of psychiatric symptoms, there were no significant differences in their views ($p>0.6406$). Both groups of respondents concurred that the people with TBI did not exhibit any psychiatric symptoms in the period preceding their injury. Furthermore, in terms of post-injury functioning on this dimension, both individuals with TBI and their secondary care-givers reported that the individuals with TBI had started manifesting psychiatric symptoms in the period following their injury. There were no significant differences in the self reports of people with TBI and their ratings by the secondary care-givers with regard to post-injury functioning on the dimension of strange behaviour ($p>0.9364$).

When comparing the views of the primary and secondary care-givers on the dimension of psychiatric symptoms, there were no significant differences in their rating of the functioning of the person with TBI. This was the case both in terms of premorbid functioning ($p>0.6250$) and post-injury functioning ($p>0.9515$). Both the primary and secondary care-givers believed that the individuals with TBI had not manifested psychiatric symptoms prior to sustaining TBI, but had done so in the post-injury period.

5.4. Perceived Disturbances in Mental Functioning, Perceived Social Support, Health Education and Compensation-Litigation Issues

When asked whether they had additional comments to make about the functioning of the individual with TBI, 50% of the three groups of respondents stated that they had none. The other half expressed views that can be classified into four broad categories, *perceived disturbances in mental functioning*, *perceived social support*, *health education* and *compensation-litigation issues.*

5.4.1 Perceived Disturbances in Mental Functioning

About half of the individuals with TBI (50%) reported that in the period following their injuries, people had started remarking that they were behaving as if they were mentally disturbed. One respondent with TBI stated: “Shortly after I returned from hospital, people started saying that I am crazy, I’ve lost my sanity”. Another participant with TBI stated that: “People say I am a write-off because I forget everything easily, my knowledge has gone down the drain”. The primary and secondary care-givers of these respondents confirmed that these individuals had changed from the people they had been before the injury. Some care-givers stated the individuals with TBI had become very "short-tempered", "more expressive of their emotions", "agitated", "hyperactive" and "easily discouraged by things they could not do".

On a different note, a small proportion of the individuals with TBI, their primary care-givers and secondary care-givers stated that the individuals with TBI were showing improvement in their condition.

5.4.2. Social Support

Most of the individuals with TBI reported that they were feeling lonely as their friends and partners had deserted them in the period following their injury. In some instances, other respondents with TBI reported that they felt that they were a burden to their families and that some family members resented this. Several respondents stated they felt that some members of their families resented them because they were not showing any improvement following their TBI. This was particularly the case with the respondents recruited from Natalspruit hospital (Katlehong township). They expressed the view that their TBI had placed major financial burdens on their families. Furthermore, the respondents from Natalspruit hospital more often expressed the sentiment that their dependence on other people to assist them with their personal needs created displeasure in their families. This view was less often expressed by individuals from Barney Hurwitz hospital.

The sentiments of the individuals with TBI about their loneliness were echoed by their primary and secondary care-givers. These care-givers tended to report that these individuals had become "withdrawn", "isolated", "lonely" and "deserted". One primary care-giver explained that the isolation might be due to the fact that: "people find it hard to adjust to his difficulties".

With regard to the relationship between the individuals with TBI, and their primary and secondary care-givers, the latter stated that the individuals with TBI "hated being forced to do things". The care-givers added that "some of these are things they have to do, like going for rehabilitation and physiotherapy sessions".

5.4.3. Health Education

When asked whether they had been given any education or information on how to cope with the individuals with TBI, a large majority of the respondents responded in the affirmative. They mentioned that they had been given information about the condition of the person with TBI by neurosurgeons, neuropsychologists, physiotherapists, occupational therapists and hospitals nurses. In most cases, the information was given to the primary and secondary care-givers, presumably due to the fact that the individuals with TBI are usually not completely recovered at the time of the discharge from the hospital.

Most of the respondents stated that the information that they had received from the neurosurgeons was extremely negative, distressing and pessimistic. They stated that they had been told that the individuals with TBI would never be able to walk, speak properly, or think properly again. The respondents stated that they had found the information very distressing, and in the subsequent period the opposite had happened. The individuals with TBI had steadily improved, started walking, speaking properly and thinking properly again. The information from the physiotherapists, occupational therapists and hospital nurses was reported as having been most useful. According to the respondents (primary and secondary care-givers), this information had focused on the practical day-to-day management of the individuals with TBI, and ways of coping for the families.

5.4.4. Compensation-Litigation Issues

As pointed out in Chapter 3, compensation-litigation issues have also been found to play a role in the sequelae of TBI. Of the 14 individuals with TBI, only 3 had legal proceedings underway at the time of this study. The primary and secondary care-givers of these individuals reported that they had consulted their attorneys who had started the process of claiming compensation for injuries suffered. One individual with TBI had already received a *Third Party* compensation from the *Motor Vehicle Association of South Africa*. Three individuals were receiving a Disability Grant from the State. The rest of the respondents had not been compensated in any form and were not receiving any disability grant.

5.5. Summary

5.5.1. Premorbid Emotional Functioning

As the foregoing account has shown (section 5.3) most of the respondents believe that the individuals with TBI did not have emotional difficulties prior to their injury. They are reported to have been emotionally stable in the period preceding their injury.
All the individuals with TBI, their primary care-givers and secondary care-givers share this view.

5.5.2. Current Emotional Functioning

The current emotional functioning of the individuals with TBI is the post-injury functioning. On the whole, significant changes in emotional functioning were reported on the following dimensions of the Katz Social Adjustment Scale: *Depression/Catastrophic Reaction; Emotional Lability; Irritability; Apathy; Suspicion (Paranoia)/*

Persecutory Anxiety; Loneliness and Social Withdrawal; and *Psychiatric Symptoms.* Except for one dimension, *Suspicion (paranoia)/ persecutory anxiety*, there was consensus between the individuals with TBI, their primary care-givers and their secondary care-givers, that changes had occurred in the emotional functioning of individuals with TBI.

No significant changes in the emotional functioning of individuals with TBI were reported in the post-injury period on the following dimensions of the Katz Social Adjustment Scale: *Anger; Aggression; Euphoria; Disinhibition and Hostility to People;* and *Strange Behaviour.* Except for the dimension of anger, there was consensus between the individuals with TBI, their primary care-givers and their secondary care-givers, that changes had not occurred on these dimensions.

5.5.3. The role of premorbid factors as determinants of the outcome of TBI

On the basis of the findings of the present study, it is not possible to establish a direct link between premorbid emotional functioning and the outcome of TBI. Stated differently, it is not possible to confirm or disconfirm that certain aspects of premorbid emotional functioning can mediate the impact of TBI as some of the literature states. For instance, all of the 14 respondents with TBI were reported to have become more depressed following their TBI irrespective of premorbid emotional functioning. Also, there were no changes in their functioning on the dimension of euphoria following TBI irrespective of premorbid emotional functioning.

5.5.4 Patterns of changes in emotional functioning that can be linked to areas of brain injury

On the basis of the current data, it is not possible to link changes in emotional functioning to specific areas of brain injury. As mentioned in Chapter 4, the medical records of the 14 individuals with TBI indicated that they had frontal lobe injuries, but did not specify the exact site of the lesion, for instance, whether the injury was on the prefrontal or premotor cortex. However, emotional changes may be tentatively linked to areas of brain injury retrospectively by linking the changes that had occurred with specific lesion sites proposed in the literature.

5.5.5. Discrepancies in self-reports provided by individuals with TBI and the ratings by primary and secondary care-givers

With regard to the emotional changes on the dimensions of *Emotional Lability, Irritability, Apathy, Loneliness and Social Withdrawal,* and *Psychiatric Symptoms*, there was consensus between the individuals with TBI, their primary care-givers, and their secondary care-givers, that the changes had occurred. Furthermore, there was consensus between the individuals with TBI, their primary care-givers and their secondary care-givers that changes had not occurred on the following dimensions of emotional functioning: *Aggression; Disinhibition and Hostility to People;* and *Strange Behaviour.*

However, with regard to the dimensions of *Depression/Catastrophic Reaction* there were statistically significant differences between the views of the three groups of respondents. The individuals with TBI tended to under-report their feelings of depression, while their primary and secondary care-givers identified these as difficulties.

Furthermore, on the dimensions of *Suspicion (paranoia)/Persecutory anxiety* and *Lack of Concern/Diminished Anxiety/Egocentricity,* there were discrepancies between the views of the individuals with TBI, their primary care-givers and their secondary care-givers. The individuals with TBI and their secondary care-givers reported that major emotional changes had occurred on the dimension of *Suspicion (paranoia)/ Persecutory anxiety* following TBI, whereas the primary care-givers mentioned that they had not observed any major changes. With regard to the dimension of *Lack of Concern/Diminished Anxiety/Egocentricity*, the individuals with TBI and their primary care-givers reported that no major changes in emotional functioning had occurred, whereas the secondary care-givers stated that they observed some emotional changes .

It must be noted, however, that the differences between the three groups of respondents with regard to the emotional changes on the dimensions of *Suspicion (paranoia)/ persecutory anxiety* and *Lack of concern/Diminished Anxiety/Egocentricity* were not statistically significant. If the differences had been significant, the views of the individuals with TBI and their primary care-givers would carry more weight. This is due to the fact that the primary care-givers are considered to have greater insight into the emotional functioning of the individuals with TBI, having lived with them both before and after the TBI.

5.5.6. Perceived disturbances in mental functioning, Perceived Social Support Health Education and Compensation-Litigation issues

As was the case with quantitative data, the qualitative data provided by the individuals with TBI, their primary care-givers and secondary care-givers points to the fact that these individuals exhibited changes in their mental and emotional functioning in the period following their injuries. These changes are reported to have been of concern to those who were familiar with the individuals with TBI prior to their injuries. Also, some care-givers believe that these changes contributed to the isolation of the individuals with TBI, and to a decline in the social support that they perceived as available to them. Various health professionals are said to have given health education and information to the care-givers of the individuals with TBI. Guidance from the neurosurgeons is said to have been least helpful as it was pessimistic, while that from the rehabilitation workers and nursing personnel is felt to have been most useful as it was practical. Very few individuals with TBI were engaged in compensation-litigation issues at the time of the study.

5.7. Conclusion

On the whole, except for the changes on the three dimensions, *depression/catastrophic reaction*, *suspicion (paranoia)/persecutory anxiety* and *lack of concern/diminished anxiety/egocentricity*, there was consensus between the individuals with TBI, their primary care-givers and their secondary care-givers about the emotional changes that had occurred or not occurred following TBI. Also, there was consistency between the qualitative and the quantitative data provided by the three groups of respondents.

The next chapter discusses these findings and their implications.

CHAPTER 6

DISCUSSION

6.1. Introduction

When discussing the results of the present study, it is important to contextualize them within the four competing viewpoints in the literature on the relationship between TBI and emotional functioning. To recapitulate, the first view asserts that frontal lobe injury causes profound changes in personality and emotional functioning, which are commonly known as the *frontal lobe syndrome*. The second perspective holds that an individual's premorbid emotional functioning is an important determinant of the outcome of brain injury and of the individual's response to the injury. The third view holds that the hemisphere on which the injury has occurred determines changes in emotional functioning after traumatic brain injury. The fourth perspective postulates that both premorbid factors and the nature of the traumatic brain injury are equally decisive in producing the observed effects of the damage. It was largely due to this unresolved controversy in the literature that the present study was undertaken, with a view to shedding some light on the controversial issues.

6.2. The implications of the results of the study

The findings of this study partially confirm the first view highlighted in the foregoing discussion, that individuals who experience TBI subsequently exhibit features of the *frontal lobe syndrome*. It was found that most of the individuals with TBI did not have emotional difficulties prior to their injury. However, in the post-injury period, the participants with TBI were reported to have exhibited changes in emotional functioning that fit the description of the *frontal lobe syndrome*. On the adapted Katz Social Adjustment Scale, these participants were reported to have manifested statistically significant changes on dimensions of emotional functioning such as *depression/catastrophic reaction, emotional lability, irritability, loneliness and social withdrawal, apathy*, and *psychiatric symptoms*. These findings are corroborated by the qualitative data provided by the three groups of respondents, which pointed out that the individuals with TBI had become *easily discouraged by things they could not do, short-tempered, and more expressive of their emotions.*

The results of this study are to a large extent consistent with the findings of studies conducted by researchers such as Yarnell and Rosie (1990), Miller (1991, 1993) and Lezak (1983, 1995), who reported that the individuals with TBI manifested features such as depression, euphoria, irritability, anger, apathy, and emotional lability, amongst other features, However, this view could not be confirmed entirely as these changes occurred in some but **not** in all dimensions of emotional functioning. This finding corroborates the argument advanced by authors such as Stuss et al. (1992) that the *frontal lobe syndrome* is not a monolithic, uniform entity, but a combination of diverse behavioural and emotional changes in a person. It would therefore be useful to examine changes in each of the dimensions of emotional functioning of the individuals with TBI.

The reports of depression and catastrophic reaction among the respondents with TBI in the present study, is consistent with the findings of other studies. According to Lezak (1995), depression is the single most commonly reported emotional response following TBI. Several other researchers, for instance, Burns et al. (1994), Lee et al. (1993), Stuss et al. (1992), and Burton et al. (1988), also found a prevalence of depression in individuals with TBI. The contentious finding that most studies cannot explain adequately is whether depression among individuals with TBI is their psychological reaction to the injury, or due to the extent of the neurophysiological injury. Prigatano (1992) points out that the causes of depression following TBI are complex, and continues to state that clinical depression among individuals with TBI often appears to be a reaction to failure or loss. This view is echoed by Diamond et al. (1988) who contend that high levels of depression might indicate the patients' reaction to the injury, and low depression levels might be due to psychological processes of repression and denial. A different perspective to this debate is advanced by authors such as Robinson and Chait (1985, cited in Prigatano, 1992), who assert that depression after TBI is attributable to a neurological basis, particularly in the acute stages of TBI.

At another level, high levels of distress among individuals with TBI have been linked to a perceived lack of social support. Kaplan (1990) found that individuals who manifested high levels of insecurity, and lower levels of emotional stability and self –discipline had a more negative evaluation of available social support. According to Kaplan (1990), the converse was also true. Those individuals with TBI who experienced stronger social support showed less emotional distress and a greater indication of more positive vocational outcomes. Indeed, other authors have issued a reminder that TBI does not occur in a vacuum, but in the context of the family (e.g. Miller, 1991 &1992). In the present study, however, there were high levels of distress irrespective of perceived social support. The individuals with TBI came from diverse social backgrounds, and those from Headway perceived themselves as having adequate social and material support, and objectively appeared to be receiving such support. The respondents from Natalspruit hospital perceived their TBI as being compounded by the lack of moral and material support from their families. They reported that their families who had expected that they would recover fully, had been disappointed and were perceiving them as burdensome. However, the levels of distress were high amongst both groups of individuals with TBI, irrespective of perceived social support.

The finding in the present study that there were no significant changes on the dimension of euphoria is not consistent with the findings of other studies (Lee et al.,1993; Lezak, 1983, 1995; Prigatano, 1992). In their investigation, Lee et al. (1993) found euphoria to be common among the participants. They found that it occurred more frequently after right hemisphere inactivation whereas depression was common following left hemisphere inactivation (Lee et al., 1993). In the present study, however, this was not confirmed.

The finding that the respondents with TBI in the present study became more irritable in the post-injury period, is congruent with the results of other studies. In a study by Thomsen (1989, cited in Prigatano, 1992), 38% of individuals with TBI reported feeling irritable, while Dikmen, Temkin and Armsden (1989, cited in Prigatano), stated that irritability was reported in 60% of their sample. However, one study found that irritability is also common in non-clinical (normal) populations (Dirkmen et al, 1989, cited in 1992). Hence the ratings of irritability have repeatedly not correlated with overall measures of severity of brain injury. The findings of the present study with regard to irritability confirm Prigatano's (1992) assertion that irritability is the single most common feature reported by both individuals with TBI and their care-givers. In the present study the respondents with TBI and their primary and secondary care-givers reported a significant increase in irritability following TBI.

Persinger (1993) suggests that the increased irritability and depression and withdrawal among individuals with TBI may be indicative of a grief response to a significant loss. Persinger (1993)contends that this grief would be in response to the changes in the premorbid self-concept of the person with TBI, and would suggest a type of "identity crisis" (p. 1065). This view remains isolated, as it has not been tested in other studies.

It is striking that the respondents in the present study reported no significant changes following TBI on the emotional dimension of anger. Most other studies arrived at the conclusion that the control of anger was a long-term problem of individuals with TBI (e.g. Burton & Volpe, 1988; Lezak & O' Brien, 1990; Prigatano, 1992). Burton and Volpe (1988) found gender differences with regard to the occurrence of anger following TBI. They found that unlike women, most men in their sample reacted to the mental and physical losses resulting from TBI in an angry, impulsive manner (Burton & Volpe, 1988). Lezak and O'Brien (1990) also found that 40% of their sample, which consisted exclusively of males, also experienced moderate to severe problems with anger when evaluated in the fifth year post-injury.

Lezak and O'Brien (1990) also found that the respondents in their study had difficulty in forming or maintaining social relationships, and these authors suggested that this could have been due to the destructive role of anger in the relationships. A striking similarity between the participants in the present study and those in Lezak and O'Brien's study is that the individuals in this study also had difficulty forming or maintaining social relationships. They reported that they were very lonely in the post-injury period after having been deserted by their previous friends, acquaintances and partners. However, in the case of the participants in the present study, it is not feasible to view anger as having played a role in the destruction of their previously intact relationships. This is because there was consensus between the individuals with TBI, and their primary and secondary care-givers that anger had not been a major problem, both before and after TBI. The findings of this study partially confirm the first hypothesis, which states that the premorbid emotional functioning of the individuals with TBI will be different from their current (post-injury) emotional functioning. The hypothesis is only partially confirmed because some dimensions of emotional functioning were reported to have remained the same in both the premorbid and post-injury periods.

The findings of the present study confirm the second hypothesis of this study, which stated that the current emotional functioning of the individuals with TBI will reflect attributes that have survived the TBI, and attributes that have resulted from the TBI. This is because there were no significant changes in the emotional functioning of individuals with TBI in the post-injury period on the following dimensions of the adapted Katz Social Adjustment Scale: *Anger; Aggression; Disinhibition and Hostility to people;* and *Strange behavior.* This is unusual, as most studies (e.g. Miller, 1991, 1993; Max et al., 1998; Stuss et al., 1992) have consistently found changes in these dimensions of emotional functioning. A plausible explanation for this is the assertion by Prigatano (1987) that some personality attributes survive TBI. That is to say, they remain intact after TBI. From this angle, the dimensions of emotional functioning on which no change was reported following brain injury could be said to have survived the TBI. Attributes that have resulted from TBI would be the changes in emotional functioning described earlier. Another explanation could be that there was under-reporting of negative emotional functioning by the participants in the present study. The issue of under-reporting is dealt with at length later in this discussion.

The findings of the present study could not confirm or disconfirm the fourth hypothesis made in the study, that there would be ways in which the premorbid emotional functioning of individuals with TBI has moderated the impact of TBI. This was for two reasons. First, all respondents with TBI were reported to have been emotionally stable in the period preceding their injury. Second, the changes in the emotional functioning of the individuals with TBI that were reported to have occurred in the post-injury period, appear to have occurred irrespective of their premorbid personality. Thus, these findings could not confirm or disconfirm Donovick and Burright's (1989) assertion that the interpersonal difficulties that are often attributed to brain injury appear to be "exaggerations" of behaviour patterns expressed prior to the injury in a given individual. It was not possible to determine the premorbid behaviour patterns that were "exaggerated".

Another case in point is the issue of depression and euphoria. According to Stuss and Benson (1986, cited in Lee et al., 1993), TBI does not change premorbid personality per se, but accentuates preexisting emotional tendencies or traits. They point out, for instance, that in their response to the injury, characteristically outgoing individuals (extroverts) become more euphoric and the more shy individuals (introverts) become depressed. In this study, this pattern could not be established. The individuals who exhibited symptoms of depression in the post-injury period were people who were described as having been emotionally stable and showing no signs of introversion or extroversion in the pre-injury period. Their families did not see these individuals as prone to depression, or even to euphoria. Thus Stuss and Benson's (1986) assertion could not be confirmed or disconfirmed in the present study.

On the basis of the current data, it is not possible to link changes in emotional functioning to specific areas of brain injury. The medical reports at the disposal of the individuals with TBI and their primary and secondary care-givers did not indicate the specific site of the lesion (brain injury), except to say it was a frontal lobe injury. It was also not feasible to consult all institutions and clinicians that had treated the people with TBI. Thus it was not possible, for instance, to determine whether the participants in this study had left or right hemisphere damage.

However, when working backwards, that is, starting from the findings of the study and moving towards identification of the hemisphere with injuries, some useful information comes to light. First, it will be recalled that the participants in this study reported significant changes in the dimensions of depression/catastrophic reaction, emotional lability and loneliness, and social withdrawal. In most studies, it was individuals with left hemisphere injuries who were found to exhibit these changes. For instance, Goldstein (cited in Cullum & Bigler, 1988) observed that patients with left hemisphere damage tended to manifest depressive symptomatology. Gainotti (1972, cited in Cullum & Bigler, 1988) also observed that patients with left hemisphere damage often manifested 'anxious-depressive reactions'. Lezak (1983, 1995) also states that patients with left hemisphere damage report feelings of depression and catastrophic reaction more than their counterparts with right hemisphere damage. The findings of this study are not unproblematic, however, as other studies (eg. Finklestein, 1982; Folstein et al., 1977, cited in Cullum & Bigler, 1988) found greater depression amongst stroke patients with right as opposed to left hemisphere damage.

The foregoing exposition suggests that it would be safest to adhere to Cullum & Bigler's (1988) caveat that the relationship between depressive symptoms and the site of injury is highly complex and may be influenced by a multitude of procedural and intraindividual factors. Thus the third hypothesis made in this study, which stated that amongst individuals with TBI there would be patterns of emotional functioning that can be linked to areas of brain injury, could not be confirmed or disconfirmed on the basis of the data gathered in this study.

The fifth hypothesis, which stated that there would be statistically significant discrepancies between the self-reports provided by the individuals with TBI and the ratings by significant others, was largely disconfirmed. There was consensus between the individuals with TBI, their primary care-givers and their secondary care-givers that significant changes had occurred on dimensions of emotional functioning such as: *Depression/catastrophic reaction; Emotional lability; Irritability; Loneliness and social withdrawal,* and *Psychiatric symptoms;* there was consensus between the individuals with TBI, their primary care-givers, and their secondary care-givers, that the changes had occurred. Furthermore, there was consensus between the three groups of respondents that changes had not occurred on the dimensions of *Anger, Aggression, Disinhibition and*

Hostility to people, Euphoria, lack of concern/Diminished anxietyEgocentricity, and S*trange behaviour.*

There were, however, discrepancies between the views of the three groups of respondents with regard to two dimensions of emotional functioning, namely, depression/catastrophic reaction and lack of concern/diminished anxiety/egocentricity, which slightly confirmed this hypothesis. While the individuals with TBI denied that changes had occurred following the TBI on the depression dimension, their primary and secondary care-givers reiterated that these changes had taken place. This may be attributed to poor insight or social desirability bias on the part of the respondents with TBI.

In the present study, in cases where there was no agreement between the views of the respondents with TBI, and their primary and secondary care-givers, the views of the latter were regarded as carrying more weight. As Lezak (1983, 1995) and Prigatano (1987) point out, certain effects of brain damage are more often noticed by relatives (and co-workers) of the brain damaged individuals.

The tendency of individuals with TBI to underplay or underestimate the extent of their emotional disturbance following injury, has been reported in many other studies (Prigatano, 1992; Yarnell & Rosie1990). Some researchers have interpreted this as a defense mechanism of denial. According to Nockleby and Deaton (1987), the denial of newly acquired impairments may have an organic or psychological basis or both. Nockleby and Deaton (1987) assert that from a psychological perspective, the denial of deficits by the individual with TBI may have an adaptive function of protecting the person from the immense distress that could follow if there was full self-awareness of one's changed abilities. In their study, these authors found that there was less distress and despair in individuals with TBI who denied their deficits and an increase in subjective distress as the denial became less complete (Nockleby & Deaton, 1987). They also found that denial enabled the person with TBI to preserve self-esteem and hope for the future.

The significance of the finding that the neurologists tended to give the individuals with TBI and their primary and secondary care-givers a negative and pessimistic prognosis of TBI, is somewhat unclear. It would appear that these health workers wanted to err on the side of conservatism, and not raise the hopes of the individuals with TBI and their families. Notwithstanding this, the information they supplied to these respondents was experienced as unhelpful and distressing. The rehabilitation and nursing personnel were seen as having been more helpful since they supplied information that was experienced as practical and contributing to the day to day management of the individual with TBI.

Whereas authors such as Diamond et al. (1988) have pointed out that compensation-litigation issues may play a role in the manifestation of the symptoms of TBI, this is not thought to have been the case or to have influenced the findings of this study. The reasons for this are twofold. First, only three respondents had legal proceedings underway at the time of the study, and no other respondents expressed an intention to start with similar proceedings. Also, the present investigator made it clear at the outset that this study would have no implications for any treatment the individuals with TBI might be undergoing, and for any legal matters that might be pending.

6.3. Conclusion

This chapter has discussed the findings of the present study, and contextualized them within the four competing viewpoints in the literature on the relationship between TBI and emotional functioning. The chapter has also examined the findings of the study against the hypothesis advanced at the outset. The first viewpoint, which holds that TBI results in the 'frontal lobe syndrome', and which is linked to the first hypothesis made in the present study, was partially confirmed. This was because the respondents with TBI were reported to have exhibited changes that fit the description of this syndrome in the post-injury period. However, this view and the first hypothesis, could not be completely confirmed as these changes did not happen in all the dimensions of emotional functioning. The present study has also corroborated the argument advanced by some authors that the ‘frontal lobe syndrome’ is not a monolithic, uniform entity, but a combination of diverse behavioural and emotional changes in a person.

The second viewpoint, which holds that an individual’s premorbid emotional functioning is an important determinant of the outcome of TBI, and which is linked to the fourth hypothesis of the present study, could not be confirmed or disconfirmed. This was because all of the 14 respondents with TBI were reported to have been emotionally stable in the period preceding their injury. The changes that were reported to have occurred in the period following their injury were said to have occurred amongst all 14 individuals with TBI, irrespective of their prior emotional functioning. It must added, however, that there were aspects of premorbid emotional functioning that remained intact after the TBI. These were dimensions of emotional functioning on which no changes were reported in the post-injury period.

The third viewpoint, which holds that the hemisphere on which the TBI has occurred determines the consequent changes in emotional functioning, and which was linked to the third hypothesis of this study, could not be confirmed. This was largely due the limited information at the disposal of the individuals with TBI and their care-givers, and thus to the researcher. The specific site of the frontal lobe injury could not be located.

The fourth perspective, which postulates that both premorbid factors and the nature of the traumatic brain injury are equally decisive in producing the observed effects of the damage, was partially confirmed. This is due to the fact that while the role of TBI in producing changes in emotional functioning was clearly identified in the present study, the role of premorbid factors could be not be elucidated with equal precision. It was only noted that some aspects of premorbid functioning remained intact following TBI.

The fifth hypothesis made in this study, which stated that there would be statistically significant discrepancies between the self-reports provided by the individuals with TBI and the ratings by significant others, was largely disconfirmed. In the majority of cases, there was consensus between the individuals with TBI, their primary care-givers and their secondary care-givers that significant changes had occurred or not occurred, on particular dimensions of emotional functioning.

In the next chapter the conclusions and limitations of this study are presented.

CHAPTER 7

CONCLUSION

This study has established that there are certain aspects of premorbid emotional functioning that change following TBI. It has also established that some aspects of premorbid emotional functioning remain intact after the injury. However, this study has not been able to distinguish areas of traumatic injury that can be associated with particular disturbances in emotional functioning. Also, the study has not been able to single out aspects of premorbid emotional functioning that mediate the impact of TBI. As Grafman et al (1989) state, issues surrounding premorbid personality and post-injury behavioural changes are too complex to be resolved at a given point in time.

7.1. Limitations of the study and suggestions for future research

The findings of this study should be understood and interpreted within the context of the limitations inherent in the study. First, this was a retrospective study that assessed the premorbid functioning of individuals with TBI after the injury had occurred. As Max et al. (1998) correctly state, "any post-injury assessment of pre-injury function is subject to inaccuracies" (p. 331). Ideally, a prospective study would be *the* alternative. However, it is difficult to use a prospective approach to the study of TBI, since it is not feasible to predict who is likely to sustain TBI.

Another limitation of the present study is the small sample size, which makes it impossible to generalize the findings to all individuals with TBI on the frontal lobes. It is suggested that a similar study be undertaken with a much bigger sample size, which could better elucidate the nature of the relationship between TBI and emotional functioning.

Yet another shortcoming of the present study is the fact that in most cases it was not possible to locate the exact site of the frontal lobe injury, due to the limited information at the disposal of the people with TBI and their families. It was thus not feasible to link patterns of emotional functioning to particular areas of brain injury. This is a critical issue, and it would be useful if future studies could examine the exact location of the TBI, and elucidate the role of particular parts of the brain, for instance, the left and right hemispheres, in emotional functioning after TBI.

Furthermore, the present study did not have a control group consisting of individuals with TBI on lobes other than the frontal lobe. However, as pointed out in chapter 4, the pilot study was done on individuals with TBI on the temporal and parietal lobes. The families of these respondents also reported changes in emotional changes following TBI. The question that arises here, and which the present study cannot address, is whether the changes in emotional functioning following TBI are exclusive to individuals with frontal lobe injuries, or whether people with TBI on other lobes (temporal or parietal) are also susceptible to these changes. It is suggested that future studies address this research question.

This study did not examine the cognitive functioning of the individuals with TBI. It might be possible that some aspects of the reported emotional functioning are due to impaired cognitive functioning. For instance, the denial by the participants with TBI of certain changes in their emotional functioning might be due to a lack of insight or poor memory on their part. However, the corroboration of the views of the respondents with TBI with the those of their primary and secondary care-givers enhanced the validity of the information gathered.

7.2. Conclusion

Notwithstanding the limitations highlighted above, the present study has made a significant contribution to the debate on the relationship between TBI and emotional functioning. First, while many studies have focused on the association between TBI and personality in general, this is one of the few studies that have isolated a specific aspect of personality, in this case emotional functioning, and examined it in detail. Second, this study has confirmed that TBI does result in *the 'frontal lobe syndrome'*. However, this study has also highlighted the crucial point that the *frontal lobe syndrome* is not a **monolithic** or uniform entity, but a group of diverse emotional and behavioural changes. The participants in this study were recruited from diverse social settings, different socio-economic circumstances, different linguistic groups and different lifestyles, but similar patterns of emotional changes were found amongst all of them. This indicates that changes that were reported were associated with TBI, and not with the social background of the individuals with TBI.

Finally, this study has attempted to shed some light on the contentious issue of the relationship between TBI and emotional functioning. Despite its limited scope, the study should serve as a stimulus for more advanced research into the nature of the relationship between TBI and emotional functioning.

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APPENDIX I

EMOTIONAL FUNCTIONING IN PEOPLE WITH TRAUMATIC BRAIN INJURIES

INFORMATION AND CONSENT FORM

PATIENT'S NAME…………………………

DATE…………………………………

INFORMATION AND CONSENT FORM

Hello, my name is Clifford Thulani Masilela. I am a Master of Arts (MA) student in Clinical Psychology at the University of the Witwatersrand (WITS). I am currently conducting research with a population group of individuals who have been diagnosed as having traumatic brain injuries (brain injuries incurred from an accident or a violent incident). I am focusing mainly on their emotional functioning and behaviour. That is to say, I am examining the ways in which people with brain injuries express their emotions, and how their behaviour is, and whether these are similar to or different from how they were before suffering the brain injury.

The interview will be aimed at completing a questionnaire comprised of 65 questions. In the case of the brain injured person the examiner will complete the questionnaire and in the case of a family member it would be requested that they complete the questions by means of ticking off "almost never", "sometimes", "often", and "almost always".

I request people with traumatic brain injuries, and the people who lived with them for at least a year before they suffered their injuries, and who still live with them currently, to voluntarily participate in this study. All information will be treated as strictly confidential and participants may withdraw from this study at any time.

THE SEQUENCE OF PROCEDURES IS AS FOLLOWS:

(1) Interviews with the brain injured person

An interview will be conducted by the researcher with the person with a traumatic brain injury, using a questionnaire. This will take about 40-50 minutes.

(2) Interviews with the people who have lived with the brain injured person before and after the injury (next-of-kin)

Two of the people who have lived with the brain injured person at least one year before the injury and still live with them now, will also be interviewed by the researcher using a questionnaire similar to the one used in the interview with the brain injured person. These two people will be interviewed together, but separately from the brain injured person. This will take about 60 minutes.

(3) Risks

No physical injury or harm, nor emotional discomfort is foreseen from the interviews that will be conducted with the brain injured person and his/her next-of-kin.

4) Benefits

The benefit of this study is that feedback sessions will be conducted with the brain injured people and their next-of-kin in which your understanding of the relationship between traumatic brain injury and emotional functioning will be enhanced.

WRITTEN CONSENT

I..., have read the attached information sheet and consent to participate in this study. I consent to participating in the interviews that the researcher will conduct.

I understand that the results will be used for academic purposes and that all information will be treated as strictly confidential.

I understand that participation in this study is voluntary and that I may withdraw at any time of my own accord.

Signed.......................................Subject................................Date

....Researcher.........................Date

....Witness..............................Date

GAUTENG PROVINCIAL GOVERNMENT

Enquries : Dr G M O Mazizi
Tel. : (011) 389-0512
Fax : (011) 909-3015

DEPARTMENT
OF HEALTH

NATALSPRUIT HOSPITAL
Private Bag X01
ALRODE
1451

....
....
....
....

Sir/Madam

re: **APPLICATION TO CONDUCT RESEARCH AT NATALSPRUIT HOSPITAL**

Permission is hereby granted to Thulani Clifford Masilela I D No 700227 5454 089 to conduct research as outlined in his Research Proposal at Natalspruit Hospital.

Thank you.

NATALSPRUIT
HOSPITAL / HOSPITAAL
1998 -09- 04
SUPERINTENDENT

SENIOR MEDICAL SUPERINTENDENT
GMOM/wtz
1998-08-17

APPENDIX III

MODIFIED VERSION OF THE KATZ SOCIAL ADJUSTMENT SCALE: PATIENTS

RESPONDENT NO ___________ (PERSON WITH TBI)

BIOGRAPHICAL DATA

1. Name : ______________________________

2. Age : ______________

< 20 YRS	21-30 YRS	31-50 YRS	41-50 YRS	51-60 YRS	61+
1	2	3	4	5	6

3. Gender : __________________

Male	Female
1	2

4. Number of Years of Completed Schooling:

None	0-4 (Lower Primary School)	5-7 (Higher Primary School)	8-12 (Secondary or High School)	13+ (Tertiary Education
0	1	2	3	4

5. Employment: ____________________________________

Un-employ.	Self-Employ.	Manual Worker	Domestic Worker	Office Worker	Profession al	Other
1	2	3	4	5	6	7

5. Marital Status:

Single	Married	Widowed	Divorced	Living Together
1	2	3	4	5

6. Race (For demographic reasons only):

Black	White	Indian	Coloured
1	2	3	4

NB.

Please answer the following questions, putting a cross (X) in the box which best describes yourself as you are now.

If regarding a particular question, there has been no change following the injury, please put a circle and a cross in the same box. Do not spend too long on each question; your first impressions are likely to be the most accurate, but please make sure that you answer every question indicating how you were before the injury and as you are now.

Remember:

X = Yourself as you were before
O = Yourself as you are now

A. EMOTIONAL FUNCTIONING

A.1 DEPRESSION / CATASTROPHIC REACTION

DO YOU:

1. Get very critical, start to blame yourself for things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before x				
After O				

2. Cry easily

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

3. Act as if you do not have much energy

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

4. Feelings get hurt easily

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

5. Feel that people do not care about you

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

6. Get very sad, blue

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

7. Worry or fret

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

8. Attempt suicide

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

9. Say how bad or useless you are

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

10. Complain about people and things in general

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

11. Talk about suicide

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.2 EMOTIONAL LABILITY

DO YOU:

12. Have mood changes without reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

13. Have temper tantrums

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

14. Show your feelings

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

15. Refuse to speak at all for periods of time

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

16. Speak so low that other people cannot hear you

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

17. Speak loudly

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.3 ANGER

18. Get angry and break things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

19. Become resentful

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

20. Shout or yell for no reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.4. IRRITABILITY

21. Get annoyed easily

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

22. Quickly react to something other people say or do

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.5. **AGGRESSION**

23. Get angry and break things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

24. Get into fights with people.

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

25. Threaten to injure certain people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

26. Threaten to tell people off

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

27. Say you are afraid you will injure somebody

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

28. Say you are afraid that you will not be able to control yourself

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.6 EUPHORIA

29. Get excited for no reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

30. Get very happy for no reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.7. APATHY

31. Have periods where you stop moving or doing something

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

32. Just sit

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

33. Act helpless

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

B. SUSPICION (PARANOIA)/PERSECUTORY ANXIETY DO YOU:

34. Have strange fears

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

35. Become afraid something terrible is going to happen

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

36. Get nervous easily

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

37. Get sudden fright for no reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

38. Think people are talking about you

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

39. Act as if you are suspicious of people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

40. Say people are talking about you

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

41. Say that people are trying to make you do or think things you do not want to

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

42. Talk as if you have committed the worst sins

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

43. Talk about people or things you are afraid of

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

44. Say or act as if people are after you

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

44. Say something terrible is going to happen

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

C. LONELINESS AND SOCIAL WITHDRAWAL

45. Feel lonely

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

46. Stay away from people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

47. Are you shy

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

48. Are you quiet

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

49. Do you prefer to be alone

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

D. DISINHIBITION AND HOSTILITY TO PEOPLE

DO YOU:

50. Act as if you have no control over your emotions

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

51. Argue

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

52. Curse at people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

53. Are you critical of other people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

E. LACK OF CONCERN/ DIMINISHED ANXIETY/ EGOCENTRICITY

54. Do you act as if you do not care about other people's feelings

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

55. Think of only yourself

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

56. Have you been described as stubborn

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

F. STRANGE BEHAVIOUR

DO YOU:

57. Do strange things without reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

58. Laugh or cry at strange things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

59. Believe in strange things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

60. Talk about strange sexual ideas

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

G. PSYCHIATRIC SYMPTOMS

61. Have bad dreams

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

62. Act as if you see people or things that are not there

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

63. Talk to yourself

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

64. Laugh or cry at strange things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

65. Talk without making sense

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

66. Do other people find it hard to understand your words

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

H. GENERAL QUESTIONS

67. Are other things that people say about you in your daily life that you would like to mention?

68. Are there any other things that people say about you that you would like to mention?

69. Have you requested/applied for compensation for your head injuries? Please give details:

70. Are there any other additional comments you want to make?

I. HEALTH EDUCATION

71. Have you been given any information about your condition?

72. If yes, who gave you the information and what did it entail?

73. Did you find the information useful?

74. If yes, in what ways was the information useful?

75. If no, why was it not useful?

Thank-you for all your assistance

APPENDIX (IV

MODIFIED VERSION OF THE KATZ SOCIAL ADJUSTMENT SCALE: RELATIVES

CARE-GIVER NO ________ **RELATIONSHIP** ____________________

Please answer the following questions, putting a cross (X) in the box which best describes the person as he/she is now. After doing this, please put a circle (O) in the box which describes the person as s/he was before his/her injury.

If regarding a particular question, there has been no change following the injury, please put a circle and a cross in the same box. Do not spend too long on each question; your first impressions are likely to be the most accurate, but please make sure that you answer every question indicating how the injured person was before the injury and as he/she is now.

Remember:

X = Injured person before the injury
O = Injured person now

A. EMOTIONAL FUNCTIONING

A.1 DEPRESSION / CATASTROPHIC REACTION

DOES HE/SHE

1. Get very critical, start to blame him/herself for things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

2. Cry easily

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

3. Act as if he/she does not have much energy

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

4. Feelings get hurt easily

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

5. Feel that people do not care about him/her

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

6. Get very sad, blue

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

7. Worry or fret

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

8. Attempt suicide

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

9. Say how bad or useless he/she is

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

10. Complain about people and things in general

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

11. Talk about suicide

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.2 EMOTIONAL LABILITY

DOES HE/SHE

12. Have mood changes without reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

13. Have temper tantrums

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

14. Show his/her feelings

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

15. Refuse to speak at all for periods of time

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

16. Speak so low that other people cannot hear him/her

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

17. Speak loudly

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.3 ANGER

18. Get angry and break things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

19. Become resentful

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

20. Shout or yell for no reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.4. IRRITABILITY

DOES HE/SHE

21. Get annoyed easily

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

22. Quickly react to something other people say or do

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.5. AGGRESSION

DOES HE/SHE

23. Get angry and break things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

24. Get into fights with people.

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

25. Threaten to injure certain people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

26. Threaten to tell people off

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

27. Say that he/she is afraid s/he will injure somebody

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

28. Say that he/she is afraid that s/he will not be able to control him/herself

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.6 EUPHORIA

DOES HE/SHE

29. Get excited for no reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

30. Get very happy for no reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

A.7 APATHY

DOES HE/SHE

31. Have periods where he/she stops moving or doing something

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

32. Just sit

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

33. Act helpless

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

B. SUSPICION (PARANOIA)/PERSECUTORY ANXIETY

DOES HE/SHE

34. Have strange fears

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

35. Become afraid something terrible is going to happen

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

36. Get nervous easily

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

37. Get a sudden fright for no reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

38. Think people are talking about him/her

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

39. Act as if he/she is suspicious of people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

40. Say people are talking about him/her

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

41. Say that people are trying to make him/her do or think things he/she does not want to

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

42. Talk as if he/she has committed the worst sins

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

43. Talk about people or things he/she is afraid of

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

44. Say or act as if people are after him/her

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

44. Say something terrible is going to happen

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

C. LONELINESS AND SOCIAL WITHDRAWAL

DOES HE/SHE

45. Feel lonely

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

46. Stay away from people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

47. Is he/she shy

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

48. Is he/she quiet

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

49. Does he/she prefer to be alone

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

D. DISINHIBITION AND HOSTILITY TO PEOPLE

DOES HE/SHE

50. Act as if he/she has no control over his/her emotions

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

51. Argue

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

52. Curse at people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

53. Is he/she critical of other people

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

E. LACK OF CONCERN/ DIMINISHED ANXIETY/ EGOCENTRICITY

DOES HE/SHE

54. Act as if he/she does not care about other people's feelings

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

55. Think of only him/herself

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

56. Has he/she been described as stubborn

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

F. STRANGE BEHAVIOUR

DOES HE/SHE:

57. Do strange things without reason

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

58. Laugh or cry at strange things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

59. Believe in strange things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

60. Talk about strange sexual ideas

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

G. PSYCHIATRIC SYMPTOMS

DOES HE/SHE

61. Have bad dreams

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

62. Act as if he/she sees people or things that are not there

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

63. Talk to him/herself

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

64. Laugh or cry at strange things

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

65. Talk without making sense

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

66. Do other people find it hard to understand his/her words

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

H. GENERAL QUESTIONS

67. Are other things that people say about him/her in his/her daily life that you would like to mention?

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65. Talk without making sense

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

66. Do other people find it hard to understand his/her words

	Almost Never 1	Sometimes 2	Often 3	Almost Always 4
Before X				
After O				

H. GENERAL QUESTIONS

67. Are other things that people say about him/her in his/her daily life that you would like to mention?

68. Are there any other things that people say about him/her that you would like to mention?

69. Has he/she requested/applied for compensation for his/her head injuries? Please give details:

70. Are there any other additional comments you want to make?

I. HEALTH EDUCATION

71. Have you been given any information about his/her condition?

72. If yes, who gave you the information and what did it entail?

73. Did you find the information useful?

74. If yes, in what ways was the information useful?

75. If no, why was it not useful?

Thank-you for all your assistance