ANOTHER BEAUTIFUL MIND: A CASE STUDY OF THE RECOVERY OF AN ADOLESCENT MALE FROM A TBI

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ABSTRACT

The purpose of this study was to present a descriptive, explanatory case study of an adolescent male survivor of a traumatic brain injury (TBI). The subject was a 17 year, 6 month old student enrolled in the twelfth grade at a highly selective science and technology governor's high school in the suburbs of a major metropolitan area. This investigation explored how a recovery can be successfully accomplished after a moderate-to-severe TBI. A case study methodology was employed to conduct an empirical and contextual investigation using a multi-modal method of data collection. Data collection consisted of archival records, documents, interviews, participant-observation, and direct observation. Overall findings from this study revealed that support from his family, educational personnel, and medical professionals coalesced to aid his recovery. In addition, the data indicated that there were distinct, but overlapping phases through which this individual progressed to reach a point of successful functioning. Moreover, all research pointed to one event, a college deferment decision and its accompanying behavioral changes as evidence that a turning point in the recovery had occurred. Thus, the adolescent had entered into the acknowledgment and acceptance phase. His ultimate successes stemmed from this decision and from this point in time. Implications for future research are discussed.

Traumatic brain injury (TBI) has become a serious public health problem for our nation's children. The Neurologic Disabilities Support Project [NDSP] (2006) reports that each year 1,000,000 children will sustain a TBI. According to the American Academy of Neurology Foundation (2005), more children in the United States die from brain injury than any other cause. Likewise, brain injury is the most reported diagnosis to the National Pediatric Trauma Registry (1993). Not only is TBI a significant cause for hospitalizations (Dunn, Thurman, & Alverson, 1999) and emergency room visits (McCarthy, Serpi, Kufera, Demeter, & Paidas, 2002), it is the leading cause of death and a principal contributor to a spectrum of morbidity involving cognition and adaptive behaviors associated with brain injury for children and adolescents (Broman & Michel, 1995). Further underscoring the morbidity, a study conducted on survivors of TBI, revealed that 80% of the severely injured children either failed a grade or were in a modified educational environment two years after their injuries (Ewing-Cobbs, Fletcher, Levin, Iovino, &Miner, 1998).

Often described as an invisible epidemic, TBI causes unspeakable, and for some, unbearable losses. It is nearly impossible to measure the human costs of TBI. How do we estimate the extent of the loss borne by family and friends when a child dies prematurely from a brain injury? For the family and friends of survivors, there is no estimate of the physical and psychological burdens they bear as they care for their injured loved ones.

Only limited analyses of the monetary costs of TBI are available with a wide range in estimates and factors considered. A conclusion from the 1998 National Institutes of Health (NIH) Consensus Statement was that the economic consequences of a TBI are immense, reporting estimates of annual costs of $9,000,000 to $10,000,000 for the acute care and rehabilitation of new cases of TBI. The average lifetime care cost estimates range from $600,000 to $1,875,000 for a person with a severe TBI. By comparison, NIH estimates that the annual costs associated with TBI exceed those of other well-known, chronic medical conditions, such as spinal cord injury or AIDS (Brener, Harman, Kelleher, & Yeates, 2004). Finkelstein, Corso, and Miller (as cited in National Center for Injury Prevention and Control, 2006) report that the direct and indirect costs of TBI in the United States totaled approximately $60 billion in 2000.

Unfortunately, these estimates fail to completely measure the extent of the financial burden of TBI to society and families, because they exclude such measures as costs to social services systems and lost earnings. Also, there appear to be underreported or hidden costs of TBI. For example, using data from the Centers for Disease Control and Prevention (CDC), Ylvisaker and colleagues (2001) calculate there is a conservative estimate of approximately 20,000 *new* cases per year of children and adolescent TBI-related chronic disability that must be managed within the nation's school systems. By this calculation, they assert that the number of children with TBI-related disability is considerably larger than the 11,895 reported to Congress by the U.S. Department of Education. Despite the number of students served within the TBI category having risen more recently to approximately 21,000 (*26th Annual [2004] Report to Congress on the Implementation of the with Disabilities Education Act, 2006)*, due to considerable variability within states in eligibility criteria, application or non-use of special education categories, and reporting practices, the prevalence of educational disability from TBI is likely much greater than these numbers indicate.

It is difficult to estimate the impact, value of time and loss of earnings to family members who are the care-givers. There is gathering evidence that TBI can have profound and persistent adverse effects on the entire family (Wade, Carey, & Wolf, 2006). Studies have documented ssignificantly higher levels of psychological symptoms (Wade et al., 2006) and distress among the family members (Wade, Taylor, Drotar, Stancin & Yeates,; 1996) subsequent to a TBI, as well as a deterioration in family functioning (Rivara, Jaffe, Polissar, Fay, Liao, & Martin, 1996; Wade, Taylor Drotar, Stancin & Yeates, 1996; Wade et al., 1998). Wade et al. (1998) found that 40% of parents experience anxiety and depression at clinically significant levels. Effects on the family functioning include marital tensions and peer relationship strain; altered family roles (Rivara et al., 1996; Wade et al., 1996); disruptions in family life (Wade et al., 1998); global family relationship and functioning deterioration (Rivara et al., 1996); and diminished coping resources (Rivara, Fay, Jaffe, Polissar, & Martin, 1992). These cumulative effects on the family indicate a need for family-centered interventions. However, rehabilitation professionals condemn the lack of comprehensive community-based rehabilitation and support programs. Furthermore, managed medical care has distributed services among numerous providers, thereby fragmenting service and contributing to a worsening of support (Bell, Hoffman, Doctor, Powell, Esselman, Bombardier, Fraser, & Dikmen, 2004; Wade et al., 2006). Therefore, quantifying and measuring the financial impact of these effects on families is complex and incomplete at the present time. Logically, the increase in incidence of TBI can be attributed to the medical and technological advances made in recent history. Since 1980, the rates of TBI-related death have declined 20% according to a December 1999 Report to Congress prepared by the National Center for Injury Prevention and Control. At the same time, they report a 50% decline in TBI-related hospitalizations. During this period, fiscal restraints were being put in place to contain health care costs that led to modifications in hospital admission policies, thereby restricting inpatient care for TBI victims. Although there are more children surviving traumatic brain injuries, they are receiving less immediate medical care. Likewise, economic forces have dramatically reduced the lengths of stay for children in rehabilitation programs (Ylvisaker, 1998; Ylvisaker et al., 2001). Thus, brain-injured children are returning to their homes and schools with less support and to a waiting public that is ill-prepared to care for them. Ylvisaker noted that the people most responsible for delivering rehabilitative services to children with chronic disabilities following a TBI were the everyday people in the children's lives such as family members, school staff members, and paraprofessionals. The cruel irony of this situation is that everyday people are not well informed on how to help rehabilitate these children. To better help children living with the effects of TBI, we need better information on the nature and scope of the resulting disabilities, and better data on what treatment and instructional practices are the most effective are needed.

Although the profile of effects from a TBI is as individual as the children who have TBI, each experience adds to the collective knowledge about brain injuries. Common themes and sequelae following a TBI have been identified along with some strategies that work effectively in compensating for the myriad residuals of brain injuries. However, the degree of recovery in higher cerebral functioning possible for a given individual continues to be both a clinical and scientific guessing game (Prigatano, 1987; Taylor, 2004). Since 1987, much research (e.g., Anderson, Catroppa, Morse, Haritou, & Rosenfeld, 2000; Ewing-Cobbs, Fletcher, Levin, Francis, Davidson, & Miner, 1997; Ewing-Cobbs et al., 1998; Jaffe, Polissar, Fay, & Liao, 1995; Levin, 1995; Olver, Ponsford, & Curran, 1996, Ylvisaker et al., 2001,) has been conducted which sheds some light on the outcomes of TBI, but considerable variability still occurs (Fletcher, Ewing-Cobbs, Francis, & Levin, 1995; Yeates, 2000). Why some patients with serious injuries recover remarkably well and other patients with milder injuries suffer from permanent and unyielding effects still remains, to a degree, a mystery.

The extreme variability among TBI students and the unusual profiles of cognitive and behavioral functioning tend to be more vexing than physical disabilities for school staff, family, and friends (Feeney & Ylvisaker, 1995; Lehr, 1990; Perrott, Taylor, & Montes, 1991; Ylvisaker & Feeney, 1996, 1998). Despite many well-intentioned school personnel, educators and school psychologists frequently underestimate a student's need for supports in the early months or years after injury, which in some cases results in significant failure and increasing disability for the student (Ylvisaker & Feeney, 1998).

Written hospital reports are typically not helpful to educators. Assessments by hospital staff are recognized as having limited educational relevance and value. Inferences from standardized, out-of-context test performance are especially dangerous for students with TBI, particularly those with frontal lobe injury (Bigler, 1988: Dennis, 1991; Eslinger & Damasio, 1985; Grattan & Eslinger, 1991; Mateer & Williams, 1991; Stelling, McKay, & Carr, 1986; Stuss & Benson, 1986; Welsh, Pennington, & Groisser, 1991). Empirical data from medical tests typically do not provide evidence about how a student can perform academically in a classroom or functionally within a school setting. Ylvisaker and colleagues (2005) noted that standardized, office-bound cognitive tests frequently do not predict real-world functioning with validity. They recommend a context-sensitive approach, emphasizing intervention embedded in the functional routines, including instructional routines, of everyday life of the survivor of TBI.

Therefore, a case study appears to be particularly well-suited to transmit useful, accessible information to a wide audience range. The distinctive characteristics of case study research allow it to be especially useful when studying TBI. Yin (1994) stated that the demand for case studies derived from the exigency to understand complex social phenomena. Case studies permit investigations to preserve holistic and essential characteristics of real-life events.

The particular need for qualitative research into TBI in children and youth was recommended in the CDC report, *Traumatic Brain Injury in the United States: Assessing Outcomes in Children* (2000). According to this report, qualitative research fosters a greater understanding of the experiences of people with TBI, as well as the care-givers and the related professionals assisting with their rehabilitation. Gaining insight from their unique and personal perspective will facilitate epidemiologic studies. Models of intra-individual change have considerable promise for determining the relationships of injury and environmental factors on outcome subsequent to a pediatric TBI.

METHOD

SUBJECT

The subject was a 17 year, 6 month old student enrolled in the twelfth grade. He attended a highly selective science and technology governor's high school for gifted students in the suburbs of a major metropolitan area. Prior to gaining admission to this nationally-known high school, the subject qualified to attend gifted-and-talented center based programs for elementary and middle school within his local school district. Before his injury, the subject was an extraordinarily high achieving student at the governor's high school. He participated in a wide variety of extracurricular activities while performing at an exceptional academic level in this rigorous educational environment. On November 23, 1998, he sustained a traumatic brain injury resulting from an automobile accident. According to reports from emergency medical personnel called to the scene, his head apparently struck the top of his car, and he was unconscious for an unknown period of time. He was taken to the emergency room of a local hospital. After some initial evaluations and an overnight hospital stay, the subject was sent home with a diagnosis of post concussive syndrome after a closed head injury with skull fracture.

DESIGN

A case study method was chosen for this investigation. The empirical and contextual method of case study research using multiple sources of evidence suits this inquiry well (Robson, 1993; Yin, 1994). The purpose of this investigation was to review, describe, and explain one individual's experience with and recovery from a TBI. Evidence for this case study came from five sources: (a) archival records, (b) documents, (c) interviews, (d) participant-observation, and (e) direct observation.

DATA COLLECTION PROCEDURES

Initially, formal written requests for release of information from the subject's parents were made for hospital, medical, and educational records. Following the subject reaching age of majority and granting written permission, requests for additional evidence were made to the subject as well as to his family.

Archival records. For this case study, there were two main sources of archival records, both in the form of organizational records: (a) hospital/medical records, and (b) educational records. Data from both sources were quantitative and qualitative.

The medical records consisted of reports from a variety of sources. Reports, clinic notes, and summary letters from a neurologist and an evaluation by an occupational therapist documented the acute phase of the injury. Also, an assessment by a speech/language pathologist that included test scores from The Woodcock-Johnson Tests of Cognitive Ability was a part of the subject's medical records. Finally, an electroencephalogram (EEG) and its consulting report by the neurologist described some initial findings after the injury.

The educational records were substantial, emanating from multiple sources. They included all the records from the eligibility evaluation for special education services and notes from individual tutorial sessions. On January 7, 1999, a multi-disciplinary meeting was held at the governor's school to review the subject's educational and medical status subsequent to his accident . In addition to the subject, his parents, and his neurologist; several high school staff members, and representatives from the school district attended this meeting. They included all of the subject's teachers, his guidance counselor, an administrator, and diagnosticians from the school district. Due to multiple concerns raised during this meeting and the short time-frame before the subject was due to graduate, he was referred for evaluation to determine if he was eligible for special education services. Also, the parents requested and the school district personnel agreed that the subject should begin individual tutoring.

The special education eligibility process included conducting psychological and educational testing and a sociocultural evaluation; reviewing medical documents and information; and collecting and analyzing written teacher narrative reports, informal assessments, classroom observations, and oral updated reports from educational personnel and the subject's family. After this evaluation process concluded, an eligibility committee met and determined that the subject met the criteria to receive special education services as a student with a TBI. Also, the subject was found eligible and offered services for students with emotional disabilities (ED). However, because the subject was seeing a private psychiatrist who was providing intensive psychotherapy and psychoactive medication management, his parents declined ED services through the public school system. Finally, an Individualized Education Program (IEP) team was convened on May 4, 1999 and developed an IEP for the subject to receive educational services to deal with the cognitive effects of his TBI.

The records used in this case study from that process include (a) Multipurpose Referral, (b) Local Screening Committee Report, (c) Permission for Testing Letter and Form, (d) Social/Cultural Assessment, (e) Psychological Evaluation, (f) Educational Evaluation, (g) Physical Disabilities Assessment, (h) Teacher Narratives, (i) School Transcript, (j) Standardized Test Results-Grades 6–8, (k) Student Observation, (l) School Physical Examination Form, (m) Vision and Hearing Screening, (n) State Literacy Testing Report, and (o) Occupational Therapy Consultation Report. The Psychological Evaluation included results from the following tests: (a) *Stanford-Binet*

Intelligence Scale: Fourth Edition, (b) *Bender Visual-Motor Gestalt Test*, (c) *Thematic Apperception Test*, (d) *Rorschach Inkblot Technique*, and (e) Diagnostic Interview. The Educational Evaluation contained data from the *Standard Battery of the Woodcock-Johnson Psycho-Educational Battery*. Finally, there were two Physical Disabilities Assessments administered a year apart which included results from the (a) *Woodcock-Johnson Psycho-Educational Battery-Revised Tests of Cognitive Ability*, (b) *Beery-Buktenica Developmental Test of Visual Motor Integration*, (c) *Pediatric Examination of Educational Readiness at Middle Childhood*, (d) Self-Awareness Inventory, (e) Parent Interviews, (f) Student Interviews, and (g) Observations. Thus, the archival records for this study were rich and provided for a thorough review and complete understanding of all phases of the recovery.

Documents. Because documents are to be used to corroborate and augment evidence from other sources, a systematic search for relevant documents was an important part of the data collection. The search yielded the following types of documentary evidence: (a) journals, (b) writing samples, (c) curricular tests, (d) letters, (e) a newsletter, and (f) a newspaper article. Each document was reviewed and analyzed to determine its relevance to the investigation. Likewise, each document was used to cross check data from other sources to provide a multi-dimensional analysis.

Interviews. Interviews conducted two years post-injury by the first author were another essential source of information for this investigation. The subject and his family members were determined to be key informants to supply relevant facts, to share their opinions about events, and to propose their own insights into certain occurrences. A focused, semi-structured interview format was chosen as the best method for gathering the most accurate evidence for this inquiry. A set of questions was derived for use during the interview; however, the semi-structured format allowed for flexibility to discover the maximum data. Likewise, face-to-face interviews were conducted because they provide the potential to understand the informants' responses more thoroughly. Moreover, face-to-face interviews permit the use of probes and prompts to insure clarity of information. Notes were made during each interview, and each interview was audio-recorded. Member checks were conducted to insure accuracy of reporting and interpretation.

Because the interviews were semi-structured, they were not identical; however, they were driven by two sets of questions. One set was asked of the three family members (Appendix A), and another, almost identical set of questions was asked of the subject (Appendix B). A thematic transcription was made subsequent to each interview. These results were then compiled. A member check was conducted with each informant individually, and finally, a group check was held to verify accuracy.

Participant observation. Participant observation was regarded to have several distinct advantages. A participant-observer has the ability to perceive reality from the point of view of someone inside the case study rather than someone removed and distant from it (Yin, 1994). Being participant-observers in this study afforded a depth of description and facilitated a more insightful interpretation of the data for both researchers. Another advantage was the ability to have access to events, people, and documents. This proximity afforded access that was important to the completeness of the investigation. In addition, field and session notes were recorded after observations and interactions with the subject of the case study and after consultations with significant others related to the subject or involved with his recovery effort. Consultations with the following personnel were conducted: the subject's doctors, guidance counselor, teachers, high school administrators, the evaluators conducting the special education eligibility testing, school district special education administrators, and his family members. Reference to these notes was made to confirm chronology, history, and accuracy.

Both formal and informal observations were made for this investigation. During the initial phases of the participant-observer roles, the researchers conducted formal observations as part of the evaluation process for eligibility for special education services. Subsequent to that process, informal observations were made by both researchers as well. These observations were made across multiple settings: (a) classroom, (b) one-to-one tutorial, (c) large social group, (d) small social group, (e) concert performance venues, (f) field trips, and (g) family home. This observational data augmented the other sources and afforded a thorough comprehension of reports, events, situations, and conditions within their context.

CASE STUDY CHRONOLOGY

A chronology is a special form of time-series analysis. It permits the investigator to determine potential causal events within their actual time frame. Also, providing a chronology of this adolescent's experience furnished the investigators with a time sequence in which to place other data gathered for the study. Reference to this chronology was conducted when reviewing and analyzing the data collected from other sources, thereby, aiding in drawing conclusions.

VALIDITY OF DATA

The purpose of a case study is to create a comprehensive understanding of one particular phenomenon. Case study methodology looks closely at an individual and draws conclusions only about that individual within his specific context. Thus, case study researchers do not focus on the discovery of a universal, generalizable truth (Yin, 1994).

While reliability and validity are grounded in quantitative research, alternative but comparable concepts are used with case study inquiry. Credibility, transferability, dependability, and confirmability established the trustworthiness of this investigation (Robson, 1993).

Credibility corresponds to internal validity and multiple techniques were used to enhance this inquiry's credibility. To afford firm credibility, sufficiently prolonged involvement, persistent observation, multiple data sources, triangulation, and member checks were employed. Transferability is congruent with external validity or generalizability. It is the researcher's responsibility to provide the data-base for potential appliers to make transferability judgments. Thus, by providing a full, detailed account allowed for transferability. Dependability corresponds to reliability. To create dependability, triangulation was used, as well as clear, systematic, well-documented processes. Finally, confirmability is congruent with objectivity. To insure confirmability, enough information was provided about the study to allow for others to judge the adequacy of the processes used within the case study and to determine if the findings were derived accurately from the data.

RESULTS

Because this case study uses data from multiple sources, each source must be analyzed in a method consistent with its type. Therefore, both interpretational and reflective analyses were employed. Using interpretational analysis, the data were examined for constructs, themes or patterns that could be used to describe or explain the phenomenon. Reflective analysis applied judgment and intuition to evaluate the phenomenon. Explanation-building, a type of pattern-matching analysis, was used to establish links between the data. Additionally, a number of standardized measures were administered to the subject to assess his cognitive, emotional, and educational functioning.

TEST RESULTS

Tests administered during the special education eligibility evaluation yielded the findings below. At the subject's request, an overall summary is provided as opposed to numeric scores. From the psychological evaluation, the subject's overall cognitive abilities were measured to be within the very superior range. However, this score was considered to be an underestimate because he did not reach a ceiling on some of the subtests. Relative weaknesses were identified in the areas of verbal comprehension, abstract verbal reasoning, and short-term visual memory.

On the tests administered to evaluate his emotional and social adjustment, the subject's responses indicated that he was experiencing emotional turmoil associated with the consequences of the TBI. His responses yielded clinically significant scores for both depression and coping deficit indices. The data revealed that he was experiencing episodes of anxiety, sadness, anger, and apprehensiveness. In general, he was determined to be vulnerable to loss of control, disorganized thinking, and impulsivity.

Results from the educational and physical disabilities assessment batteries revealed difficulties in reading comprehension and written language and deficits in visual attention, visual-spatial awareness, fine motor speed and fatigue, active working memory, and retrieval memory. An informal inventory revealed that the subject was primarily an auditory learner with secondary strengths in the experiential/kinesthetic mode. Observational data reported across the testing sessions noted that the subject was highly distractible, particularly by visual stimuli; displaying both large and small extraneous muscle movements; pacing tasks too quickly; yawning and exhibiting fatigue; and displaying mood lability.

PHASES OF RECOVERY

For this study, the term "phase" refers to a category of effects from the brain injury. It corresponds to symptoms rather than to time-referenced stages. Phases of a TBI are characteristically different from each other, but they do not have distinct boundaries. A survivor can experience more than one phase at a time. According to the data collected for this study, the subject transitioned through the following stages.

Loss of short-term memory. All sources of data confirmed that the first phase of recovery involved a significant loss of short-term memory. Interviews, medical records, and documentary evidence supported this finding as the first phase. Other educational archival records, including test results from the Psychological Evaluation and the PD Assessment and tutorial session notes made by the participant-observer documented the loss of short-term memory as the immediate effect from the subject's TBI. According to all data sources, the dramatic short-term memory loss lasted about one month, but working memory effects continued to plague the subject for approximately one year.

Sleep disturbances. All the interview informants reported that the subject experienced profound sleep disturbances as the next phase. Clinical notes from the neurologist and tutorial session notes described the development of a variety of sleep problems. The subject had difficulty with sleep onset and sleep maintenance. In addition, he had night terrors and nightmares. During this phase, he developed concomitant problems. The sleep disturbances resulted in extreme fatigue that adversely affected his stamina and concentration. These problems aggravated other effects from his injury. While the acute stage of this phase has abated, the subject and his father reported that he continues to have periodic sleep disturbances still today.

Emotional lability. The next phase was marked by the development of emotional lability. Accompanying this emotionality was suicide ideation. In addition, the subject became depressed and frustrated. All sources of data documented this phase in the sequelae following the TBI. To address the subject's problems with sleep disturbance and emotional lability, his psychiatrist prescribed multiple medications which he managed over a period of approximately 18 months.

Cognitive problems. Another distinct phase reported by all informants was the development of cognitive problems. The subject experienced problems with short-term memory, active-working memory,[1] attention, visual distractibility, spatial relations, language processing and comprehension, fine motor speed, reading, and written expression. Again, the other sources of data, most notably the Psychological Evaluation, Educational Evaluation, and the Physical Disabilities Assessment, all confirmed these cognitive difficulties. Significant cognitive effects lasted approximately nine months; however, some language processing, figure-ground discrimination, and active

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[1] For diagnostic and instructional purposes of this case study, short term memory (STM) and working memory (WM) are considered to be distinct constructs. Intervention strategies were based on this assumption and rooted in research from Baddeley (1986, 1996,) and Daneman and Carpenter (1980). Subsequent research from Swanson and Ashbaker (2000) appear to confirm this distinct construct model. Likewise, Roncadin, Guger, Archibald, Barnes and Dennis (2004) used this model in their research investigating verbal WM in children with closed head injury (CHI). Writings by Baddeley (2002, 2003) and Baddeley and Hitch (1994) provide further information on the differences between unitary short-term memory and multicomponent working memory models.

working memory issues were documented at the 15-month re-evaluation. In addition, attentional problems are still present today.

Interpersonal problems. Another phase with less distinct boundaries was the development of interpersonal problems. The subject and his sister reported his neurological sensation of isolation that lead to a disinterest in being with others and feelings of emotional distance from people. Likewise, the subject struggled with the maintenance of former friendships. His social misjudgments and subsequent behavior severely tested the one remaining, close, friendship he had. Data from the interviews, as well as documentary and archival evidence substantiated this phase. It emerged approximately six weeks post-injury with some less severe symptoms still present 18 to 24 months later.

Denial. The psychologist conducting the evaluation for special education eligibility found other evidence of denial. That data indicated that the subject was dealing with his feelings and emotions about his injury on an intellectual level, which is a form of denial. As the subject confronted some of the cognitive issues, he demonstrated acts of denial. Tutorial session notes made by a participant-observer reported this type of evidence. The subject was reluctant to engage in experimentation to explore the degrees and types of cognitive problems he was having. He often stated that he "just wanted it all behind him." He frequently related that he "wanted to get on with his life." The subject's father reported in his interview that the subject tried to convince his family that he could do things that he clearly could not do. Lastly, the subject's father noted that the subject "tended not to listen to feedback from others about his injury and its effects." This phase began approximately three months subsequent to the TBI and lasted for about nine months.

Acknowledgment and acceptance. The last continuing phase reported by all the informants was the subject's acknowledgment of his injury and the acceptance of the resulting disability. In addition, archival records and documentary evidence provided supporting data for this phase. All these sources of data reported behavior that showed a dramatic change and a new phase in his recovery. This phase began eight months post-injury.

In summary, the phases of recovery experienced by the subject were loss of short-term memory, sleep disturbances, emotional lability, cognitive problems, interpersonal problems, denial, and acknowledgment and acceptance. All sources of data indicated that while the phases were distinct, they overlapped as well.

Recovery Process Factors

As a continuing process of the investigation, it was important to identify what factors effected the subject's recovery and what factors were related to a successful, functional recovery. All interview informants were queried about possible factors in the subject's recovery (Appendix A & B). In addition, archival records were reviewed to discover the presence of factors related to recovery outcomes. The three factors identified by all informants that aided the subject's recovery were family support, educational support, and medical support. Likewise, archival records identified these three factors in the recovery process.

Interestingly, the subject's father noted a significant obstacle in his son's recovery. He reported that there was a regrettable fragmentation between the medical and educational communities. He concluded that the doctors never completely appreciated the full impact of his son's injury. The doctors who initially treated the subject saw no physical injury to the brain, so they issued a prognosis for a very quick recovery. Also, they did not inform the subject or his parents of the possible cognitive, emotional, and physical deficits that can accompany a head injury. An EEG conducted approximately six weeks subsequent to the subject's injury noted no lateralizing or paroxymal features. Therefore, there was no electrical asymmetry or seizure activity. However, this EEG report did document symptoms that the subject was experiencing in the early stages of his recovery. The report noted dizziness, distorted sounds, trouble sleeping, racing thoughts, confusion, and nightmares.

After a hospital occupational therapist (OT) conducted an evaluation, she reported that the subject was independent in all activities of daily living and that the short-term memory problems could be addressed by the hospital speech/language pathologist. Therefore, she did not recommend occupational therapy. However, the subject's parents reported that he could not be left alone at this time, because he was unable to care for himself. They did not think he was safely independent or reliable because his memory functions were still significantly impacted. Thus, the subject and his family were encountering problems similar to those reported in the literature regarding the ecological validity of standardized tests. These highly controlled assessment conditions tend to mask important functional deficits (LeBlanc, Hayden, & Paulman, 2000).

When school personnel were approached regarding academic accommodations that would need to be made for the subject, they were only willing to provide limited accommodations. The school felt that since they were identified as a "governor's school," thus having additional requirements for graduation, any accommodation which reduced the course load or the daily schedule would jeopardize the integrity of the program. Therefore, the guidance staff suggested that the subject leave the governor's school and return to his base high school where he could attend school on a part-time basis and take an additional year to graduate. However, this offer was not seen as a viable option by the subject or his parents. A change in placement would require the subject to move to an unfamiliar school building which could severely challenge the problems he was already having with route-finding and memory. Moreover, he was experiencing social and emotional problems related to the injury. At his current school, he had an established circle of friends who could be of some daily support to him. If he changed schools, he would be alone and in a severely compromised state to initiate new friendships. Likewise, the cognitive deficits were emerging and interfering with his ability to learn. They were concerned that this radical change in his environment could place him at a greater risk to develop serious psychiatric problems. After much deliberation between the school and the family, the problem was resolved by allowing the subject to attend school on a part-time basis, to drop the additional courses required for the governor's school diploma which would mean that the subject would receive a lesser diploma awarded by the school district, thus permitting the subject to graduate with his class on time.

Similar challenges were also a part of the college decision process. The subject's parents reported that the psychiatrist felt that the subject should enter college on time and deal with the problems as they arose. While this approach may have seemed logical from the psychiatrist's viewpoint, it was of great concern to the parents. The subject was continuing to exhibit cognitive, physical, and emotional problems. His parents felt that these problems made him ill-prepared to attend college and that these circumstances could negatively impact peer and professor relationships. They were concerned that the subject's behavioral and academic problems could result in a negative and potentially destructive relationship with the college administration

Both the graduation and the college decision processes revealed a lack of awareness by the educational and medical practitioners. Since there is a documented exacerbation of performance problems when an individual with a TBI is placed in unfamiliar or unpredictable circumstances (LeBlanc et al., 2000), the subject's parents feared that their recommendations could have an adverse impact on their son's recovery.

Finally, the subject's father related that when they attended the multidisciplinary conference, the eligibility meeting, and the IEP meeting, it was a "sea of confusing faces." He stated that what most of participants reported sounded more bureaucratic than therapeutic. Likewise, he indicated that they were not given anything in writing which described the roles of each participant. He believed that had he been given that written information prior to the meetings, he could have better understood the role and function of each participant. Also, when he was given the procedural safeguard literature distributed by the school district during the evaluation for eligibility for special education services, he felt that it was very difficult to understand. He stated that there was a lot of jargon and vague phrases that could be interpreted in different ways. Therefore, it was unclear what the information meant. These experiences are congruent with what is documented in the literature. Often, these needs of the families are unmet and provoke a sense of isolation. (Ylvisaker, et al., 2005)

None of the informants could identify one single factor as being more significant than others in the recovery. However, each informant included the tutorial support as being positive and aiding the subject's recovery. Also, the informants stated that the subject's academic skills became more effective; thus, they believed that he entered college better prepared for the experience. The search of the archival records revealed that the tutorial support factor had a lengthy duration of two years and four months. However, the subject stated that his own interest in his recovery was a primary factor. While the tutorial support was extremely helpful, he believed that this assistance would have been worthless without his own interest.

Turning Point

All informants were asked in their interviews if there was a turning point or a specific indicator that a successful recovery might be accomplished. Documents, archival records, and participant-observation also were used to discover evidence of a turning point contributing to a positive outcome.

While the subject's parents referred to multiple turning points, all informants included one common element. They described the subject's decision, eight months post-injury, to defer his enrollment into a four-year liberal arts college for a year and the resulting change in his behavior to willingly and consistently participate in multiple rehabilitation activities as evidence of a significant turning point. Documents, archival records, and participant-observation all confirm this decision and behavior change as a turning point leading to an indication of a successful recovery.

Evidence of Recovery

In the final stage of the investigation, documents and archival records were reviewed to determine evidence of a successful recovery. Likewise, all of the informants were queried about recovery evidence. Finally, direct observation was used to document evidence of a successful recovery.

The subject is now attending a four-year liberal arts college, and he has a superior grade point average. In addition, he earned two scholarships for his academic excellence and overall college performance.

Likewise, all sources of data provided evidence of positive social functioning. The subject participated in two acapella groups with leadership roles in both. Also, he has joined a social fraternity and served in a leadership capacity for that organization. As a result, he was featured as their fraternity member of the week in their newsletter.

It was reported and observed that the subject's relationships within his family have returned to normal. However, it does appear that the subject has a deeper appreciation for his family and prefers their company to that of others.

Post-testing completed approximately fifteen months after the subject's TBI was reviewed for further evidence of recovery. While he continued to have mild problems with attention, language processing, figure-ground discrimination, and active working memory, his performance was improved and showed evidence of recovery of functioning.

Currently, the subject continues to take medication to deal with the attentional issues that still plague him. He has experimented with dosage, setting, and even elimination of the medication, but he has determined that he still requires the medication to function optimally at college.

The interview informants reported one area that remained a concern. While the subject is successful in his college environment, his family members remained concerned about his emotional functioning and its impact on his interpersonal relationships. His parents felt that he is socially inappropriate at times and that he shows a lack of inhibition that worries them. They reported that he misinterprets social cues or over-reads social cues periodically. His father felt that he did not completely understand how others perceive social norms. Both of his parents believed that he is afraid of establishing an intimate relationship. Although the subject confirmed a reluctance to establish a romantic relationship, he did not believe that he misread or missed social cues.

CONCLUSIONS

The intent of this study was to present a descriptive, explanatory case study of an adolescent male survivor of traumatic brain injury. A case study methodology was employed to conduct an empirical and contextualized investigation. To obtain a complete picture of his recovery from a moderate-to-severe TBI, a multi-modal method of data collection was used. Evidence for this case study came from five sources: documents, archival records, interviews, participant-observation, and direct observation. Therefore, this rich, contextualized data provided an in-depth description of this one subject's experience after sustaining a TBI.

Data gathered and analyzed from multiple sources for this investigation indicated that support from three primary sources given to this survivor of a TBI proved instrumental in his recovery. Support from medical professionals, academic/educational personnel, and his family coalesced to aid his recovery. The subject received medical help from a neurologist, a psychiatrist, and a speech-language pathologist. While the timing of his accident prevented him from receiving special education support from the local school system, he did have tutorial support from a teacher who was familiar with traumatic brain injuries as well as learning strategies and compensatory techniques. Finally, the subject's family gave him needed emotional support and comfort. They maintained a balance between supporting him, giving him constructive feedback, and allowing him to have periodic autonomy.

Likewise, the data indicated that there were phases that the subject progressed through to reach a point of successful functioning: loss of short-term memory, sleep disturbances, emotional lability, cognitive problems, interpersonal problems, denial, and acknowledgment and acceptance. All sources of data concluded that while the phases are distinct, they overlapped as well.

The subject is currently in the acknowledgment and acceptance phase, and he continues to refine his progress. The recovery evidence documented that the subject made minimal progress prior to this stage. Therefore, it appears that true improvement stemmed from this stage. After he entered this stage, he made a commitment to his recovery. The resulting efforts enhanced his cognitive performance. Also, the data reflected that in order to begin this phase, the subject had to confront his perceptions of himself and his disability. He had to have reliable sources demonstrate to him the continuing effects from his TBI. By completing this process and redesigning his conceptual framework, he was able to admit the disability and change his behavior. With his active commitment to his recovery and with dedicating time and effort toward making improvement, he was able to achieve success.

As the subject and his father reported in their interviews, the recovery process can take several years. The subject felt that sheer time was an important factor. Time allows physical and emotional restoration that promotes healing. Families can provide necessary support for recovery, and they can seek both medical and educational help for their family member with a TBI.

However, the recovery cannot be rushed. Some recovery phases must be endured, but with the combination of support, the individual with TBI victim can improve.

LIMITATIONS OF THE STUDY

Two limitations should be noted in the present study. One involves the lack of available medical data immediately following the traumatic brain injury. The other is related to two characteristics of the individual examined for this case study.

It was documented in the chronology that the individual under study for this investigation was only hospitalized overnight. Therefore, there was a paucity of baseline medical data available to review. Since this data did not exist, it is hard to estimate its potential value to this study. However, it can be assumed that more baseline medical data would have granted additional analyses and comparisons with the subsequent data included in the study.

The examination of school records revealed that the subject of this study had a long history of being involved in educational programs for gifted and talented students. His school records confirmed that he possesses a superior intellect. In addition, he has extraordinary musical talent. It may be argued that because he has these characteristics, he had more resources from which to draw in order to form his recovery. However, his superior intelligence confused both medical and educational personnel, making them believe that he was more functional than he actually was. As a result, they misunderstood the effects of the brain injury, creating more complications for his recovery. Thus, the converse can be asserted as well. Because he has a superior intelligence and because he felt the effects of his TBI and the resulting discrepancies between pre- and post-injury functionality acutely, without initial confirmation from medical personnel and without initial support from educational personnel, it could have possibly lead to the more serious emotional outcomes of his TBI. Regardless, readers must review the data within this study to determine the extent to which these characteristics could confound application to other cases.

IMPLICATIONS FOR FUTURE RESEARCH

The findings from this investigation provide implications for teachers, medical personnel, and researchers involved with students who have sustained a traumatic brain injury. It contains contextualized descriptions and data that they can use to help make decisions regarding the individuals with whom they work

However, this study raises questions that bear further study. As discussed earlier, the adolescent male investigated in this study possessed documented intelligence in the very superior range. More research is needed to clarify the interaction between extremely high intellectual functioning and recovery.

The father of the subject of this case study described a fragmentation between the medical and educational communities. He felt that the doctors never completely appreciated the full impact of his son's injury. Likewise, he felt that the initial approach from the educational personnel in the early phases of the special education referral process was confusing. He reported that the interaction and communication seemed more bureaucratic than therapeutic. Thus, future research could explore better ways for medical and educational personnel to interface when caring for students with TBI. Also, educational researchers may find it useful to investigate alternative, more effective methods to communicate with parents of students who are being referred for evaluation to determine eligibility for special education services.

Finally, the evaluation process for special education eligibility took a very long time. The federal and state laws and the implementing regulations from the local education agencies mandate a thorough process that results in a lengthy time sequence. In this individual's circumstance, the process took four months. Unfortunately, graduation was just five weeks after the IEP meeting. Therefore, a multi-agency review might divulge other ways to deal with cases that may warrant emergency proceedings or interim services or consultation.

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APPENDIX A

FAMILY INTERVIEW

Name: ________________ Family Member: ____________ Date/Time: ______

1. How would you describe the subject's pre-injury academic performance?
   Follow-up: What indicators document this performance? Grades, test scores, SAT, SAT II, awards, selections, etc.
2. How would you describe the subject's pre-injury social functioning?
   Follow-up: What evidence supports this degree of social functioning? School activities, membership or selection into clubs, organizations, sports teams; leadership roles, number and/or duration of friendships, attendance at social/civic/church events, etc.
3. How would you describe the subject's pre-injury functioning within the family?
4. What were the immediate effects of the subject's TBI?
   Follow-up: Which problems lasted the longest?
5. What were the phases or stages of the subject's recovery?
6. What were the factors in the subject's recovery?
7. What was the most significant factor in the subject's recovery?
8. Was there a *turning point* or a specific indicator that a successful recovery might be accomplished?
9. How would you describe the subject's current academic functioning?
   Follow-up: What indicators document this performance? Grades, scholarships, class rank, etc.
10. How would you describe the subject's current social functioning?
    Follow-up: What evidence supports this degree of social functioning? School activities, membership in clubs and organizations, leadership roles, number and duration of friendships, attendance at social/civic/church events, etc.
11. How would you describe the subject's current functioning within the family?
12. How would you describe the subject's current status?
13. How would you describe the subject's recovery?

APPENDIX B

SUBJECT INTERVIEW

Name: _______________ Date/Time: ______

1. How would you describe your pre-injury academic performance?
    Follow-up: What indicators document this performance? Grades, test scores, SAT, SAT II's, awards, selections, etc
2. How would you describe your pre-injury social functioning?
    Follow-up: What evidence supports this degree of social functioning? School activities, membership or selection into clubs, organizations, sports teams; leadership roles, number and/or duration of friendships, attendance at social/civic/church events, etc.
3. How would you describe your pre-injury functioning within the family?
4. What were the immediate effects of your TBI?
    Follow-up: Which problems lasted the longest?
5. What were the phases or stages of your recovery?
6. What were the factors in your recovery?
7. What was the most significant factor in your recovery?
8. Was there a *turning point* or a specific indicator that a successful recovery might be accomplished?
9. How would you describe your current academic functioning?
    Follow-up: What indicators document this performance? Grades, scholarships, class rank, etc.
10. How would you describe your current social functioning?
    Follow-up: What evidence supports this degree of social functioning? School activities, membership in clubs and organizations, leadership roles, number and duration of friendships, attendance at social/civic/church events, etc.
11. How would you describe your current functioning within the family?
12. How would you describe your current status?
13. How would you describe your recovery?

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