

# Learning and Study Strategies of Students with Traumatic Brain Injury: A Mixed Method Study

Erin Bush

University of Nebraska – Kearney

Karen Hux

Samantha Zickefoose

Gina Simanek

University of Nebraska – Lincoln

Michelle Holmberg

Ambyr Henderson

Lincoln Public Schools

## Abstract

The purpose of this research was to explore the perceptions of four college students with severe traumatic brain injury and people associated with them regarding the use of learning skills and study strategies. The researchers employed a concurrent mixed method design using descriptive quantitative data as well as qualitative multiple case study data. Qualitative data came from interviews with the students with traumatic brain injury and three to four people associated with each of them; quantitative data was from the participants with traumatic brain injury and 15 to 26 of their same-class peers using the *Learning and Study Skills Strategies Inventory* ([LASSI] Weinstein, Shulte, & Palmer, 1987). Findings revealed disparities in perception between the students with traumatic brain injury and participants associated with them as well as between the qualitative and quantitative data sets of the student participants with traumatic brain injury. These differences appeared to reflect limitations in the student participants' awareness of their deficits. Despite the apparent academic success of the student participants, questions exist about the appropriateness of various accommodation strategies in maximizing postsecondary achievement and facilitating self-awareness of challenges associated with traumatic brain injury.

*Keywords: brain injury; accommodations; learning strategies*

Adolescents and young adults sustain traumatic brain injuries (TBI) more frequently than people in any other age group (Centers for Disease Control and Prevention [CDC], 2006; Langlois, Rutland-Brown, & Thomas, 2006; Rosso et al., 2007). Because of this, attention to the reintegration of students with TBI into secondary and postsecondary educational settings is important. School experiences, successes, and failures following injury have the potential to affect social, vocational, and personal satisfaction issues for the remainder of an individual's life. Consequently, professionals need to know the best methods of remediating and compensating for persistent cognitive and psychosocial challenges resulting from brain injury. A crucial aspect of this knowledge is awareness of how students with TBI and those associated with them perceive study skill strengths and challenges follow-

ing brain injury and how students apply and modify compensatory learning and study strategies in the years following their injuries.

Traumatic brain injury consequences repeatedly reported as the most problematic are those involving cognitive and behavioral functions (Bowen, 2005; Carney & Schoenbrodt, 1994; Ylvisaker et al., 2005). Cognitive challenges often affect learning and memory, information processing, perception, and communication, while behavioral challenges often negatively influence initiation and impulse control. These challenges are likely to affect personal relationships, academic performance, and vocational success. Further, these challenges combined with impaired self-awareness frequently create a scenario in which individuals with TBI are likely to struggle with multiple aspects both of school and community reintegration (Savage, De-

Pompei, Tyler, & Lash, 2005).

Inaccurate perception of one's strengths and challenges is a common consequence of TBI (Flashman & McAllister, 2002; Leathem, Murphy, & Fleet, 1998; Sherer, Bergloff et al., 1998; Sherer, Boake et al., 1998). Such a deficit – often referred to as poor self-awareness – has several negative ramifications when pursuing higher education. For example, people with TBI who have poor self-awareness often lack sufficient motivation to comply with therapeutic tasks, because the tasks address deficits of which they are unaware. Similarly, students with TBI may refuse to use compensatory strategies, because the need for strategy use is unclear to them. Furthermore, people with poor self-awareness following TBI may pursue unrealistic long-term goals, because their misperceptions prevent them from recognizing incompatibilities between desired goals and present abilities (Sherer, Bergloff et al., 1998).

Poor self-awareness magnifies co-existing cognitive challenges, and vice versa, for people with TBI. Anderson and Tranel (1989) confirmed this when they found a positive correlation between impaired cognition and impaired self-awareness among adults with severe injuries. The consequence is that people with severe TBI typically experience less awareness of their deficits than people with less severe injuries. Thus, those individuals most likely to have persistent and substantial cognitive challenges in processes underlying academic achievement—such as memory, attention, and concentration—are the same individuals who are the least likely to recognize the existence of those challenges, the associated ramifications, and the potential benefits they could gain by applying compensatory learning and study strategies.

Various compensatory strategies and accommodations exist to address cognitive impairments associated with TBI, and educational professionals routinely encourage people with TBI to implement these techniques. Typical compensatory strategies found particularly helpful include: (a) using memory books or planners; (b) using supplemental visual learning materials (e.g., handouts, pictures, diagrams); (c) engaging in drill and practice procedures; (d) having additional time to complete examinations; (e) meeting with tutors or attending help sessions; and (f) using various forms of assistive technology (e.g., palm pilots, personal data assistants, books on tape, and audio recordings of lectures) as external prostheses to bolster

cognitive processes (Bowen, 2005; Semrud-Clikeman, 2001; Sohlberg & Mateer, 2001; Ylvisaker & Feeney, 1998). External aids, in particular, allow individuals with cognitive deficits to carry out challenging tasks by reducing memory or high-level cognitive demands (Sohlberg & Mateer, 2001).

These compensatory strategies are quite comparable to those routinely used by other college students with disabilities attempting to improve their academic performance (Barga, 1996; Heiman & Percel, 2003; Lindstrom, 2007; Reis, McGuire, & Neu, 2000; Skinner & Schenck, 1992). To be effective in improving everyday functioning and overall academic achievement, however, people with TBI – as well as students with other types of disabilities – must assume responsibility for independently developing, executing, and modifying such compensatory strategies and the use of external aids (Glang et al., 2008; Ylvisaker & Feeney, 1998) as new needs arise. Currently, professionals do not know the adeptness with which students with TBI generalize compensatory strategies such as these to academic challenges faced several years following injury. They also do not know the extent to which limited self-awareness of persistent cognitive and behavioral challenges affects a person's use and adaptation of specific techniques and strategies.

The purpose of this mixed methods study was to address issues such as these by investigating the perceptions of college students with TBI and those familiar with them regarding learning skills and study strategies used to facilitate academic achievement. The researchers used the *Learning and Study Strategies Inventory* ([LASSI] Weinstein, Shulte, & Palmer, 1987) to collect quantitative data about study strategy strengths and challenges of college students with TBI and their same-class peers. Collection of these data allowed for comparison of the two populations as well as comparison with normative data available for the standardized measure. Concurrent with this data collection, the researchers conducted qualitative, semi-structured interviews and collected artifacts to explore the perceptions of the participants with TBI and those associated with them regarding specific learning strengths and challenges and the use of traditional and compensatory study skill strategies. Interview questions paralleled the concepts addressed by LASSI items, although the open-ended format of the interview questions prompted more generalized responses. The use of qualitative interviews as a data collection strategy is consistent

with the recommendations of TBI experts such as Ylvisaker et al. (2001) and Todis and Glang (2008), who have advocated for in-depth exploration of the interaction of multiple factors affecting strategy use by students with TBI.

### Design

A multiple case study design, using concurrent mixed method data collection, served as the basis for this research. Case studies provide a framework for collecting and analyzing both quantitative and qualitative data. Multiple case study designs are ones in which a specific issue or topic of concern serves as the investigational focus, but researchers use multiple case studies to illustrate it (Creswell, 2007); hence, the multiple cases provide a form of replication in which researchers use the same procedures and measures repeatedly to corroborate or contradict single case findings (Yin, 2003). A concurrent mixed methods design is one in which researchers simultaneously collect different but complementary data on the same topic. The convergence of quantitative and qualitative data provides a more complete understanding of cases than would be possible using either quantitative or qualitative data in isolation. Concurrent collection of both data types allows comparison, corroboration, and identification of data disparities.

### Research Questions

#### Quantitative Questions

Two questions pertained to the quantitative data collection and analysis: (1) What are the learning and study strategies used by college students with severe TBI as determined by responses to items on a standardized inventory of learning and study strategies? and (2) What differences exist between college students with severe TBI and their same-class peers on scores received on a standardized inventory of learning and study strategies?

#### Qualitative Questions

The two questions underlying the qualitative data collection and analysis were: (1) What are the learning and study strategies used by college students with severe TBI as determined through their responses and the responses of people associated with them to open-ended interview questions? and (2) How do college students with severe TBI and the people associated

with them describe their experiences using various learning and study strategies?

### Mixed Method Questions

The two questions the researchers addressed through mixed method analysis were: (1) For each of the four cases, to what extent are the scores received by a college student with TBI on the standardized inventory confirmed or disconfirmed by his/her responses to interview questions? and (2) For each of the four cases, to what extent are the scores received by a college student with TBI on the standardized inventory confirmed or disconfirmed by the interview question responses of people associated with him/her?

### Methods

The complexity and varying nature of persistent challenges and abilities displayed by students with TBI necessitated individual consideration of each student's academic reintegration process and progression; hence, the researchers employed a multiple case study format to allow for in-depth, individual exploration of the educational experiences of four college students who had sustained severe brain injuries. The researchers also sought to compare the study skill use of students with TBI to their same-class peers by administering a standardized measure of learning and study strategy skills. Figure 1 provides a visual diagram of the concurrent multiple case study method used to structure the research, and Figure 2 provides a visual diagram of the qualitative and quantitative data collection process for each case. The researchers obtained Institutional Review Board approval prior to initiating any data collection.

### Participants

Participants included four college students with severe TBI (student participants), three or four people associated with each participant with TBI (student-associated participants), and 15 to 26 same-class peers of each student participant (peer participants). All but the peer participants were part of a related research project reported elsewhere (Hux et al., 2009).

**Student participants.** Student participants with TBI included two male and two female college students: FM, LD, CC, and US. All four had sustained severe injuries between four and ten years prior to their participation in this research. The criterion for judging an injury as severe was a period of coma extending for

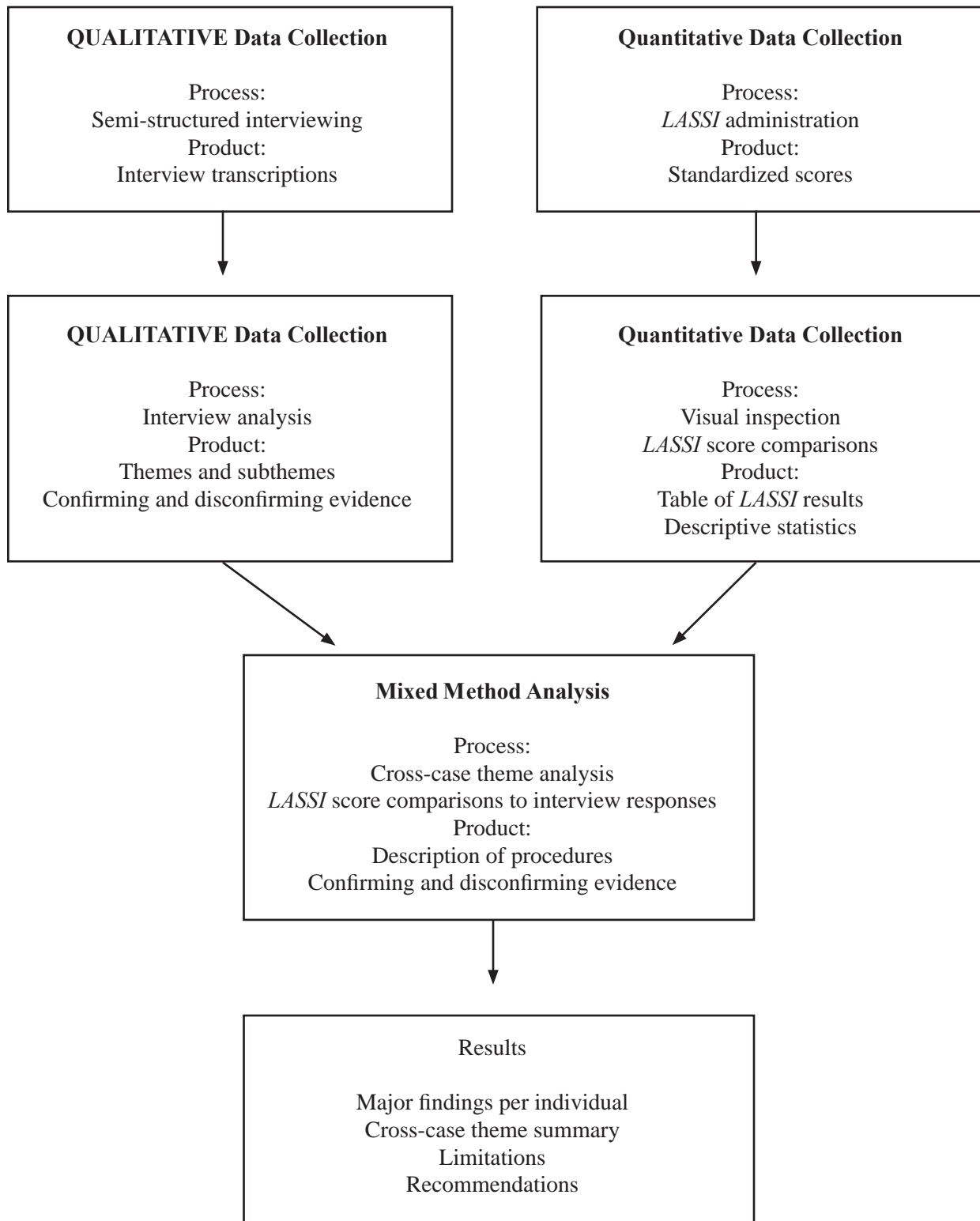


Figure 1. Visual Diagram of Concurrent Mixed Method Design

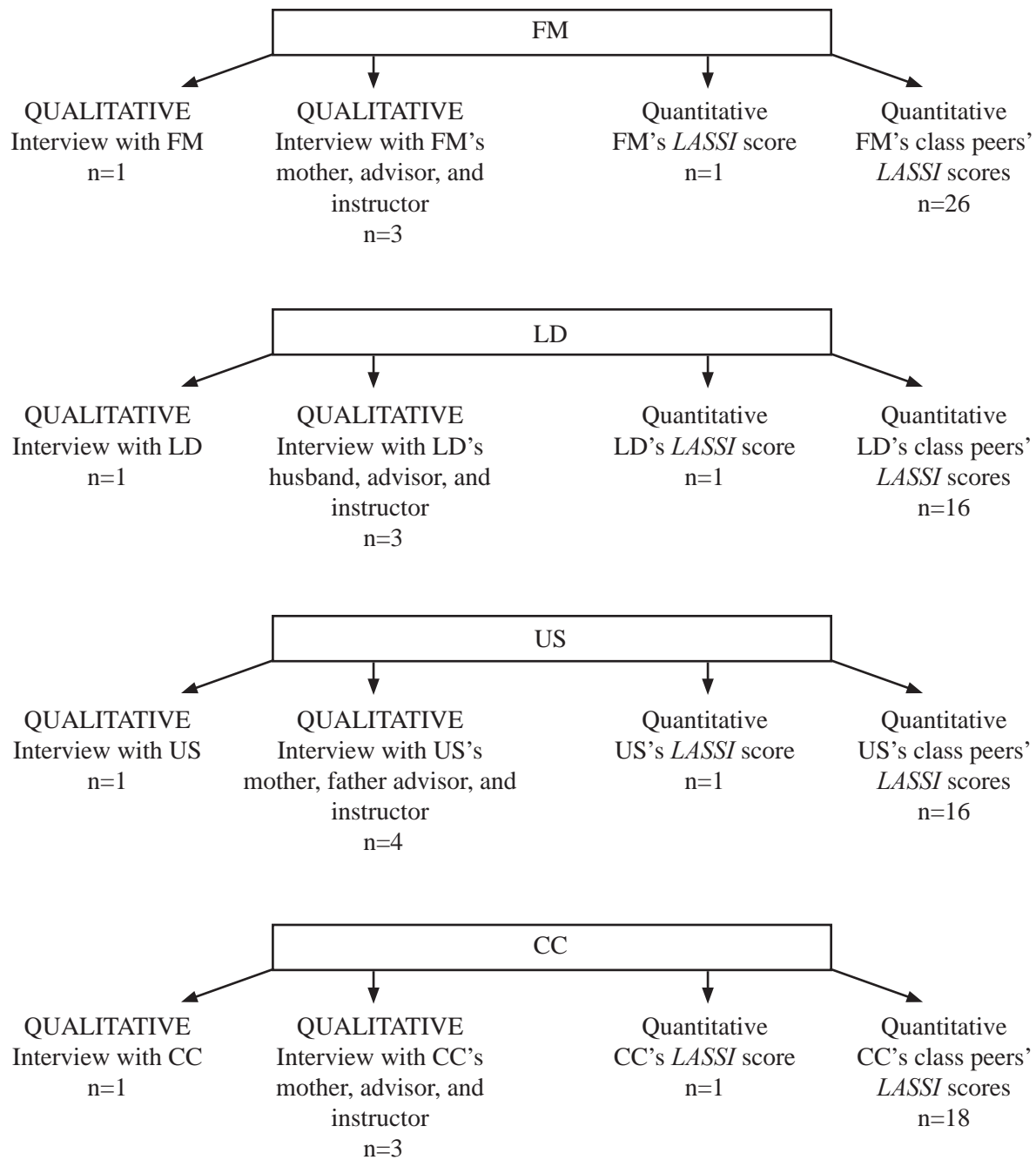


Figure 2 Visual Diagram of Multiple case studies

at least one week (Asikainen, Kaste, & Sarna, 1998). All participants had adequate hearing acuity for conversational speech. All spoke American English as their primary language and had no history of neurological problems other than those associated with TBI. At the time of their participation, they ranged in age from 20 to 28 years, having sustained injuries between the ages of 14 and 17 and having graduated from public high schools despite the seriousness of their injuries. A detailed description of each student appears in a separate publication involving the same participants (Hux et al., 2009). Demographic information about each individual with TBI appears in Table 1.

**Student-associated participants.** For each student with a TBI, associated people included three or four individuals: (a) at least one immediate family member, (b) the student's advisor from the institution's Office for Students with Disabilities, and (c) a college instructor with whom the student with TBI had taken one or more course. Family member participants were FM's mother, LD's husband, CC's mother, and both of US's parents.

**Peer participants.** Seventy-seven college student peers of the four student participants also performed the quantitative data collection tasks. The number of peer participants associated with each student participant ranged from 15 to 26 ( $M = 18.25$ ;  $SD = 4.57$ ). Peer participants included six males and 71 females ranging in age from 18.42 to 52.83 years ( $M = 23.38$ ;  $SD = 7.09$ ) at the time of participation. All spoke American English, and none reported a history of vision, hearing, or academic challenges. All had taken the same college course as the associated student with TBI and had taken that course from the same instructor who participated in the qualitative data collection process.

### Quantitative Strand

**Data collection.** The quantitative portion of this research involved data collection with a standardized instrument to examine college students' use of study skills and strategies. This complemented qualitative data in that it provided a standardized measure for objective comparison between a student with TBI and his/her same-class peers on study strategy use.

To gather quantitative data, the researchers administered the *LASSI* (Weinstein et al., 1987) to each student participant and to all peer participants interested in study participation. The *LASSI* is a self-report inventory that allows for measurement of students' strengths and weaknesses in 10 areas associated with successful

college performance. Raw scores correspond with percentile ranks normed on typical college students. The ten categories that the *LASSI* measures are: (a) Anxiety and Worry about School Performance; (b) Attitude and Interest; (c) Concentration and Attention to Academic Tasks; (d) Information Processing, Acquiring Knowledge, and Reasoning; (e) Motivation, Diligence, Self-discipline, and Willingness to Work Hard; (f) Self-Testing, Reviewing, and Preparing for Classes; (g) Selecting Main Ideas and Recognizing Important Information; (h) Use of Support Techniques and Materials; (i) Use of Time Management Principles for Academic Tasks; and (j) Test Strategies and Preparation for Tests.

The four student participants completed the *LASSI* independently. Peer participants completed the *LASSI* during a regularly scheduled class session after listening to one of the researchers provide an abbreviated explanation of the study purpose. The researcher informed peer participants that the study purpose was to examine differences among college students in their use and comfort with various study skills and strategies. The researcher did not divulge information about the brain injury component of the study to maintain the privacy and confidentiality of the student participants. Only peers wishing to participate in the research completed the study skills inventory, returning it and a form with demographic information to the researcher. Participation in the research did not affect a student's course grade.

**Data analysis.** To analyze the quantitative data, the researchers used visual inspection to compare category scores of each student participant with the range and median scores of his/her same-class peer participants. In addition, the researchers compared the peer participants' category scores with those provided as normative data in the *LASSI* materials.

### Qualitative Strand

**Data collection.** Collected data included artifacts, field notes, and interview transcripts. After obtaining signatures on informed consent forms, one of the researchers conducted interviews at a location of each participant's choosing (i.e., on campus, at an individual's home, or at a local coffee shop). The researcher digitally recorded all interviews for later transcription and analysis. The researcher conducting the interviews made addenda to the transcripts using field notes. In addition, she added any artifacts collected at the time of the interviews to the data corpus.



Table 1

*Demographic Information About Survivor Participants*

Survivor	Age	Gender	Institution	Cause of Injury	Years Post-Injury
FM	28	F	Large, public, 4-year university	MVA*	10
LD	26	F	Large, public, 4-year university	MVA*	10
CC	20	M	Community college	Sports Injury	4
US	21	M	Small, private, 4-year university	MVA*	7

\* Motor vehicle accident

Initial interview questions served to elicit specific details about each student participant’s injury, rehabilitation experiences, and recovery process. Additional questions addressed strengths and challenges regarding cognition, communication, physical limitations, social and emotional status, and academic functioning. Within the realm of academic performance, the researchers queried participants about the development and implementation of routine and compensatory study skills and strategies used by the student participant. The researchers tailored questions based on a respondent’s role in the student’s life.

The researchers completed a total of 16 interviews—four for each case. Interviews with the student participants lasted between 45 and 75 minutes; family member interviews lasted 30 to 60 minutes; and instructor and advisor interviews were between 25 and 50 minutes in duration. Data collection for each case occurred over a period of two to three months, with all interview data collected within a seven-month period.

The researchers used a bounded case study approach as a framework to collect both qualitative and quantitative data about the four student participants. The bounding of the study was uniform with an exploratory qualitative case study design (Yin, 2003). The researchers chose to employ a constructivist paradigm, because the aspects of interest in this study were individual to each participant. Though elements may have been shared across participants, the individuals experienced them all from their own point of view. In the constructionist tradition, the design was emergent, context-dependent, and employed inductive data analysis (Creswell, 2007; Guba & Lincoln, 1988).

Semi-structured interviews included follow-up questions deemed appropriate by the researcher. Debriefing and member checking by individuals participating in the interviews served to confirm the data validity (Creswell, 2007).

**Data analysis.** Analysis of the qualitative data began with the researchers’ immersion in the data corpus. The researchers reviewed each transcript several times searching for key concepts and themes. Initially, transcripts were hand-coded by three members of the research team. The researchers calculated inter-rater reliability for each 2-person combination of researchers, and inter-rater reliability did not fall below 85% in any instance. Horizontalization of utterances – that is, the extraction of key statements from transcribed interviews used to illustrate a specific point or concept (Cresswell, 2007) – was also completed for the qualitative findings along with determination of core concepts, in-depth searches for confirming and disconfirming evidence, and integration of concepts into appropriate themes. Next, the researchers identified significant statements both through hand coding and the use of Weft QDA (Fenton, 2006) coding software. The research team made decisions about the presence of confirming and disconfirming evidence based on its familiarity with the data corpus and student participant LASSI scores and its understanding of the context of information given by the student participants. This process provided information about the self-awareness of the student participants regarding personal limitations.

Finally, the researchers integrated concepts from the qualitative data sets into appropriate categories. After categorizing concepts, the researchers identified

themes emerging from the data. Triangulation served as a means of allowing the researchers to verify themes by examining multiple types of data collected. Triangulation incorporated all transcripts and artifacts relating to a single case and continued until all members of the research team reached consensus regarding the meaning of specific statements.

### Mixed Method

A mixed method approach allowed acquisition of a more complete picture of the college experiences of students with severe TBI than would have been possible using qualitative or quantitative procedures in isolation. The researchers achieved this by using quantitative procedures to target pertinent variables while simultaneously using the qualitative data to add depth and richness to the picture (Hodgkin, 2008). The researchers believed that a qualitative approach was necessary to illuminate the uniqueness with which TBI affects individuals and prompts their adoption and use of specific learning and study strategies. The qualitative approach also allowed incorporation of perspectives from people associated with the student participants throughout their college experiences. On the other hand, a quantitative approach was necessary to investigate how the student participants compared to the peer participants in terms of self-reported use and proficiency with study skills. Finally, a mixed method approach was imperative to allow the researchers to determine whether disparities existed in either of two situations: (a) between the LASSI scores of student participants with TBI and their responses to open-ended interview questions and (b) between the LASSI scores of student participants with TBI and their family members', instructors', and advisors' responses to open-ended interview questions.

### Results

The research results appear in two sections. First, the researchers highlight the case study findings for each student participant by combining quantitative, qualitative, and mixed method data representative of LASSI categories. Second, the researchers address the cross-case results with subsections for the quantitative, qualitative, and mixed method findings.

In the first section, each student participant's quantitative LASSI category scores appear in a Figure along with the median scores obtained by that person's

same-class peer participants. Normative data accompanying the LASSI is given in percentiles. Hence, the 50th percentile represents the level at which 50% of people in the normative sample scored above and 50% scored below. The peer participants in this study did not consistently score within the middle range (i.e., between the 25th and 75th percentiles) of the normative sample. This is reflective of the fact that every individual as well as every class of students has unique characteristics relating to differences in teachers' expectations, difficulty of material covered, class level, and institution type. Of note, quite variable responses occurred across all four target classes, suggesting considerable variability within LASSI categories in how students perceived their study strategy and skill strengths and challenges. The median scores for all four classes were consistently below those obtained for the LASSI normative sample.

Specific quotes from the case study students and those associated with them are presented as evidence either confirming or disconfirming individual's scores obtained regarding each LASSI category. This combined presentation of the quantitative, qualitative, and mixed method results for each student participant allowed for thorough exploration of evidence about an individual's perceptions of various aspects of learning strengths and study skills. Although illustrated only with selected quotes and short descriptions, abundant examples supporting each student's qualitative results and mixed method findings existed throughout the data corpus.

### Case Study Results

**FM.** FM's scores for each category of the LASSI appear in Figure 3 along with the median scores obtained by her same-class peers. In general, FM's responses yielded either a substantially high or a substantially low score for each category, and her percentile scores only infrequently fell in the middle range typical of students included in the LASSI normative sample. FM's scores also were not comparable to those of her peers; in fact, all of her scores were at least 25 percentile points higher or 25 points lower than the median percentile score of her same-class peers. Specifically, in seven of the ten LASSI categories, FM responded to items in a way that yielded scores between the 45th and 85th percentiles, between 25 and 55 percentile points higher than the median scores of her associated peer participants. For the remaining three LASSI categories, her responses yielded scores corresponding with the 10th percentile



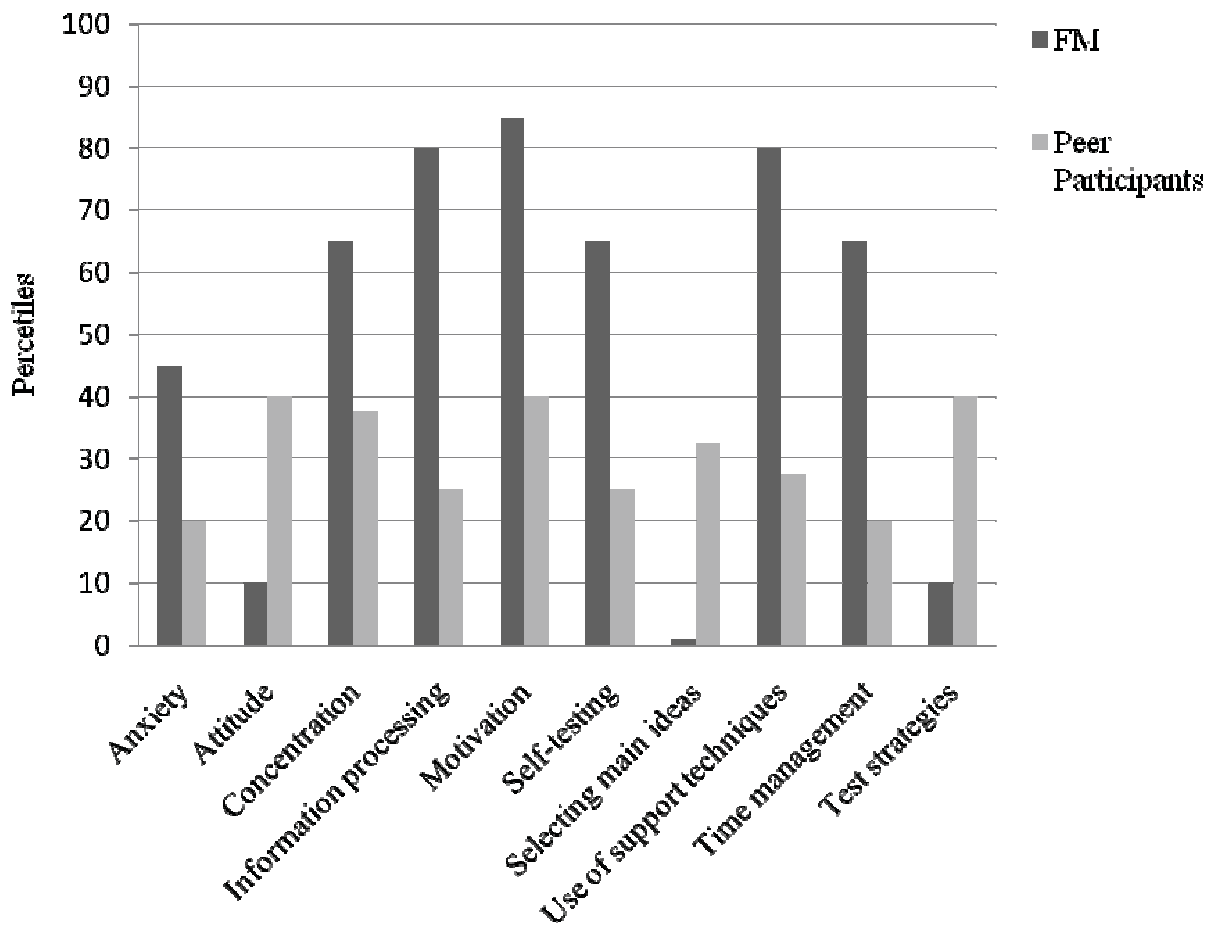


Figure 3. LASSI category percentile scores for FM and her associated Peer Participants

or lower and were about 30 percentile points below the median scores of her same-class peer participants.

FM provided in-depth information during the interview process revealing issues pertaining to six of the LASSI categories: Concentration and Attention to Academic Tasks; Information Processing, Acquiring Knowledge, and Reasoning; Motivation, Diligence, Self-discipline, and Willingness to Work Hard; Selecting Main Ideas and Recognizing Important Information; Use of Support Techniques and Materials; and Test Strategies and Preparation for Tests. Examination of the qualitative data corpus revealed that FM made statements providing both confirming and disconfirming evidence for two of these six categories, disconfirming evidence only for one category, and confirming evidence only for the remaining three categories.

Both confirming and disconfirming evidence about study skills emerged regarding the LASSI categories of Concentration and Attention and Selecting Main Ideas. For the first of these categories, FM responded

to LASSI items in a manner that yielded a mid-range percentile rating of 65. FM confirmed her perception of having skills roughly comparable to nondisabled students when she said: “I don’t want to say that I don’t [have problems], because everybody has problems with concentration....I wouldn’t say they [i.e., concentration and attention skills] are worse, but I wouldn’t say they’re better [than other students’].” However, at another point in the interview, FM acknowledged her greater struggle with mastering course content than she experienced prior to brain injury:

The level of studying is a lot higher....In high school, I didn’t study...that much, and in college a 3 credit hour class requires me to study...5 days a week. In high school, I just read over the material that I needed....Now...I need to actually be in class and hear the instructor, hear their presentation of what we’re going to be tested on.

FM's mother also provided disconfirming evidence about her perceived normality in concentration and attention by reporting: "She definitely [has]... a severe attention deficit... Physically, she could probably master driving, but it would be very dangerous... because she's single focused... There could be a kid walking, and she probably wouldn't notice it."

For the LASSI category of Selecting Main Ideas, FM's score was at the first percentile, suggesting that she perceived her skills in this area as weak. FM confirmed this perception by acknowledging her need to get notes both from teaching assistants and classroom peers to supplement her own notes. However, she also made statements such as, "I think that as long as I understand, I do significantly better [than my peers], because... I take in more," that disconfirmed her struggle to recognize and recall main ideas.

The LASSI category of Information Processing was one for which FM and the people associated with her verbalized only disconfirming evidence. Although she responded to LASSI items in this category in a manner that yielded a score at the 80th percentile of college students, numerous statements conflicted with this rating. For example, FM commented on her struggles to complete school work in a timely manner:

My friends...they can read one page in a text book in like a half hour or [less]. It takes me like an hour to read that one page. I have a hard time writing and keeping up with everything that [professors] want for me to know, so...I might need...a note taker.

Only confirming evidence appeared for the final three LASSI categories addressed during interviews with FM and those associated with her. Specifically, one of FM's instructors confirmed her self-reported high level of Motivation, Diligence, Self-discipline, and Willingness to Work Hard when he discussed her class performance: "She is [the] 'never say die' poster child...She's relentless in her efforts to try and make this work." Her advisor commented on FM's extensive use of support techniques and materials when talking about her participation in study groups and willingness to access teaching assistants for help outside of classes. As an acknowledgement of her challenges in performing well in testing situations, FM provided an example of comments she typically made to instructors early in a semester: "I would just like to...take exams in a room near you if not in your office, so that if I have

a question about something that's confusing me on the exam, I can clarify that with you."

**LD.** LD's scores on the LASSI, as well as the median scores of her same-class peer participants, appear in Figure 4. In general, LD rated herself in a similar manner to her same-class peers, and, in the categories of Self-Testing, Reviewing, and Preparing for Classes and Use of Support Techniques and Materials, her percentile scores matched the class median scores. Her scores were at or below the 20th percentile for the categories of Attitude and Interest; Motivation, Diligence, Self-discipline, and Willingness to Work Hard; and Test Strategies and Preparing for Tests. Her only score above the 75th percentile was for the category of Information Processing, Acquiring Knowledge, and Reasoning.

Many examples of LD's use of learning and study strategies emerged from the qualitative data set. The seven LASSI categories that arose as topics were: Anxiety and Worry about School Performance; Concentration and Attention to Academic Tasks; Information Processing, Acquiring Knowledge, and Reasoning; Motivation, Diligence, Self-discipline, and Willingness to Work Hard; Selecting Main Ideas and Recognizing Important Information; Use of Support Techniques and Materials; and Test Strategies and Preparation for Tests.

Both confirming and disconfirming evidence appeared in LD's interview responses and those of people associated with her regarding three of the LASSI categories (i.e., Motivation, Diligence, Self-discipline, and Willingness to Work Hard; Selecting Main Ideas and Recognizing Important Information; and Use of Support Techniques and Materials). For example, when asked about utilizing people on campus for support, LD stated, "Usually I have pretty close contact with my professors," and she later said, "I try to get to know my professor[s]...and...talk to them...[and tell them] 'I had a traumatic brain injury,...and sometimes I lose focus.'" Despite this claim, her instructor stated: "[LD] didn't self-disclose right away...She did not self-advocate. I was the one who said, 'You need to come in here and see me, and let's talk through what's going on here.'"

Only confirming evidence appeared for two of the LASSI categories addressed by LD and those associated with her. Specifically, regarding the category of Anxiety and Worry, LD reported: "Big class size was bad. I was very conscious...of everything." This acknowledgment was consistent with LD's LASSI score

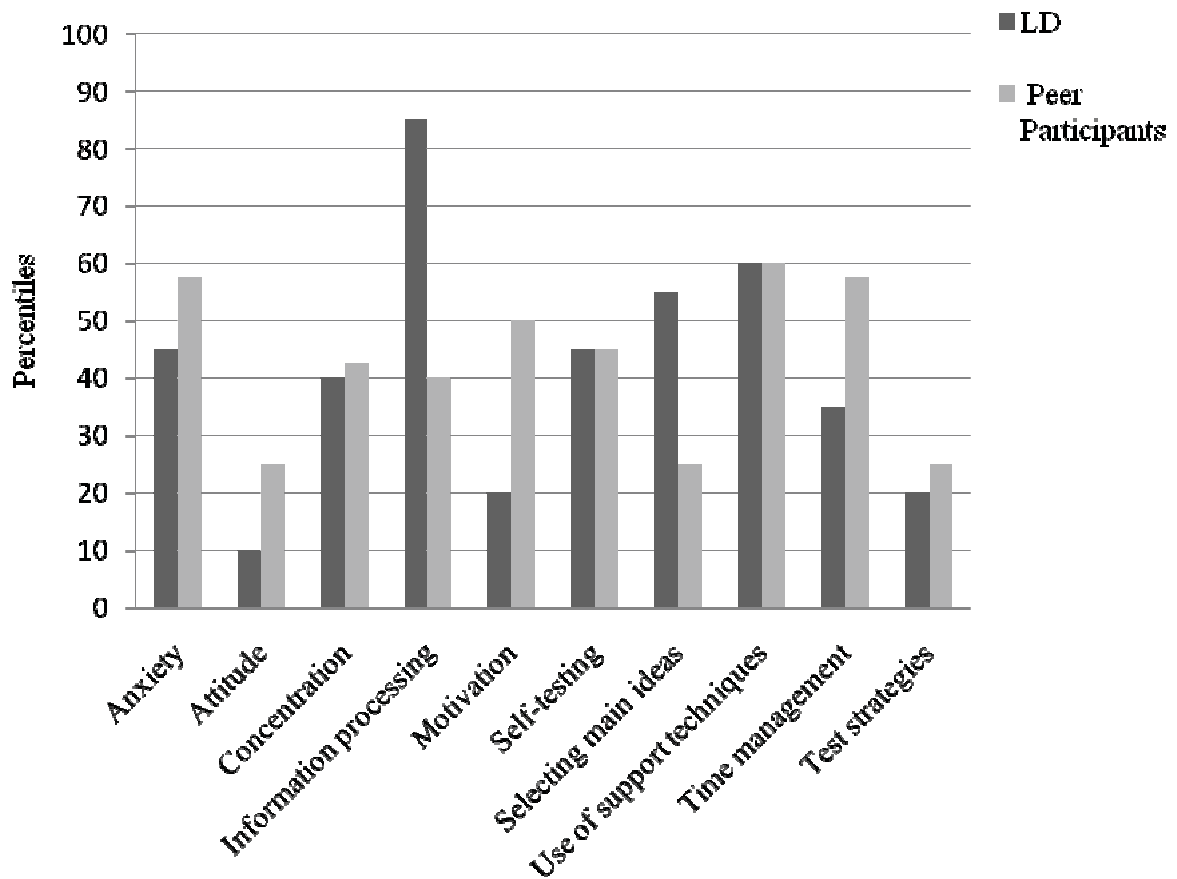


Figure 4. LASSI category percentile scores for LD and her associated Peer Participants

placing her at the 25th percentile of college students regarding Anxiety and Worry. Similarly, her 20th percentile score for Testing Strategies was confirmed by her acknowledgement of having to work hard to do well in classes:

I want to say that I'm average in my achievement, but before I was average.... Before my accident I didn't study, and I did okay. And now I study a lot, and I do okay, but [I] have to put [in] a lot more effort.

Only disconfirming evidence appeared for the two other LASSI categories addressed by LD and her associates. Regarding the category of Concentration and Attention, LD's husband contradicted her claims of average abilities by saying: "I've noticed [it is] very difficult for her to focus on certain things and concentrate for an extended amount of time....It's difficult for

her to do multiple things at once." Similarly, LD made interview statements that discounted her LASSI score at the 85th percentile in the category of Information Processing. Specifically, her statement of, "It's like you can be studying for all day...and you could look up and not have anything in your head," calls into question the notion that her information processing skills were above average.

CC. Figure 5 shows that CC did not respond to LASSI items in a manner comparable to his class peers. Specifically, his score was higher than the 70th percentile on six of the ten LASSI categories and was higher than the median percentile of his same-class peers on all categories. CC's percentile scores were at least 30 points higher than those of his peers on five categories; on the remaining 5 categories, his percentile ratings surpassed the class median by 10 points or less.

Both confirming and disconfirming evidence regarding CC's high percentile scores appeared in

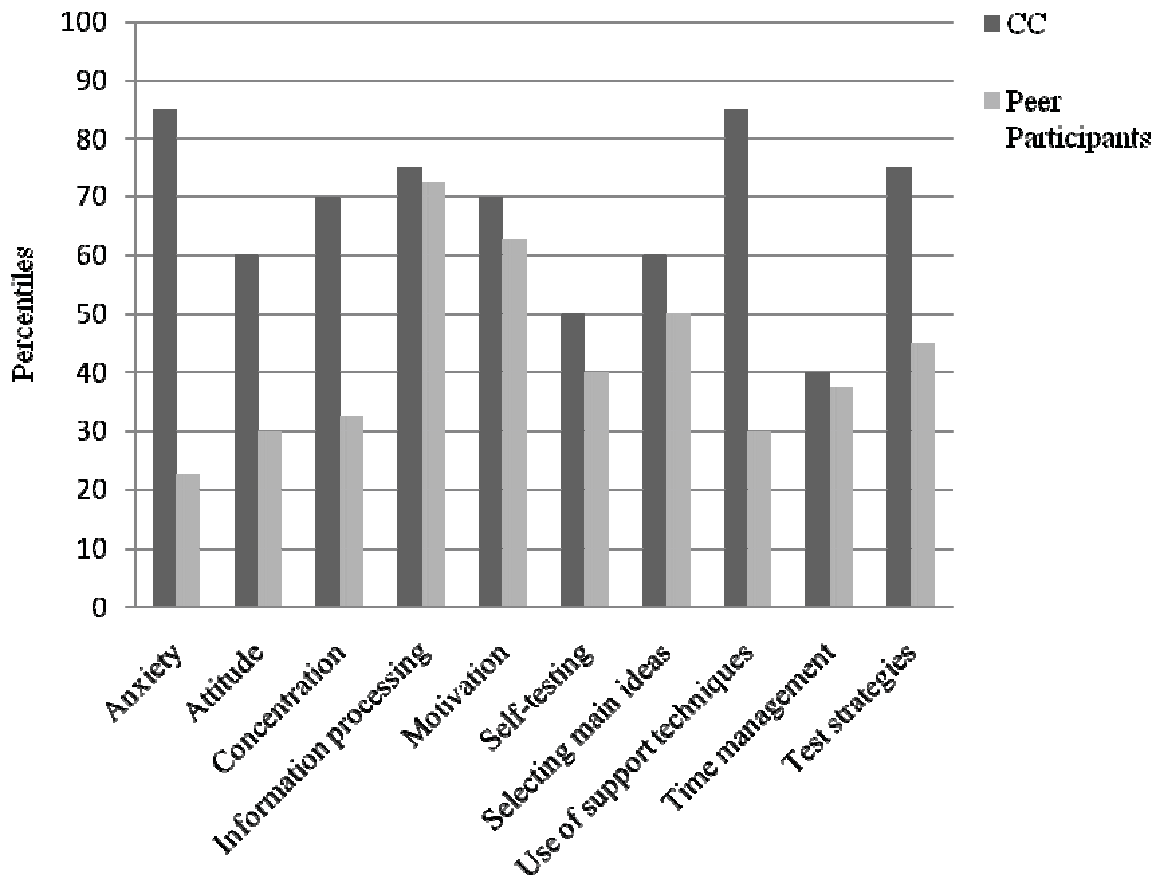


Figure 5. LASSI category percentile scores for CC and his associated Peer Participants

his qualitative data and that of the people associated with him for two LASSI categories: Motivation, Diligence, Self-discipline, and Willingness to Work Hard; and Use of Support Techniques and Materials. As an example of disconfirming evidence about his use of support techniques, the researcher asked CC whether he usually got his notes in PowerPoint format ahead of scheduled class meetings. He replied, “That really hasn’t happened that much.” This contradicted his advisor’s insistence that he received notes prior to class lectures as one of his accommodations. Also, when asked how often he met with the person responsible for coordinating his accommodations, CC stated, “I meet with him usually every quarter, but I didn’t meet with him this quarter, because I knew that my tests were going to be take home and stuff.” Disconfirming evidence of the practice of meeting regularly with his coordinator appeared in the advisor’s claim that CC had not been in to see him for nine months and that,

“He has never been here prior to a semester starting like he’s supposed to.”

Only disconfirming evidence appeared regarding CC’s skills associated with two LASSI categories. Specifically, despite CC’s attainment of a high LASSI score for Concentration and Attention, his mother reported, “... I would say the concentration to study is a deficit... [as well as] wanting to take the time to study.” Similarly, for Information Processing, CC said: “[I] take down more notes [than my peers]. I need to study more.” Despite this claim, he responded to LASSI items about Information Processing in a manner that placed him at the 70th percentile in comparison to other college students.

In contrast to the previously discussed LASSI categories, the researchers found only confirming evidence for CC’s 75th percentile ranking for the category of Test Strategies. CC’s statement of, “I study more...now than before my injury, because...I have

to if I want to get a good grade in a class to pass,” was representative of his and other people’s perceptions regarding his preparation for examinations and his test-taking strategies.

**US.** US’s responses to LASSI items resulted in superior self-reported performance in every category as compared to the results reported by his same-class peers. As evident in Figure 6, the three LASSI categories in which he was most comparable to his peers were Anxiety and Worry about School Performance, Test Strategies and Preparing for Tests, and Selecting Main Ideas and Recognizing Important Information. Even for these categories, however, US was between 5 and 25 percentile points higher than his peers’ median scores.

For all other categories, US’s ratings ranged from 40 to 76.5 percentile points above the class medians.

Data from the qualitative corpus for US pertained to five LASSI categories: Anxiety and Worry about School Performance; Information Processing, Acquiring Knowledge, and Reasoning; Selecting Main Ideas and Recognizing Important Information; Use of Support Techniques and Materials; and Test Strategies and Preparation for Tests. For the first two of these categories, both confirming and disconfirming evidence appeared; for Selecting Main Ideas only disconfirming evidence appeared; and for the final two categories, only confirming evidence appeared. Perhaps most notable regarding confirming and disconfirming evidence was his mother’s report to the researchers that

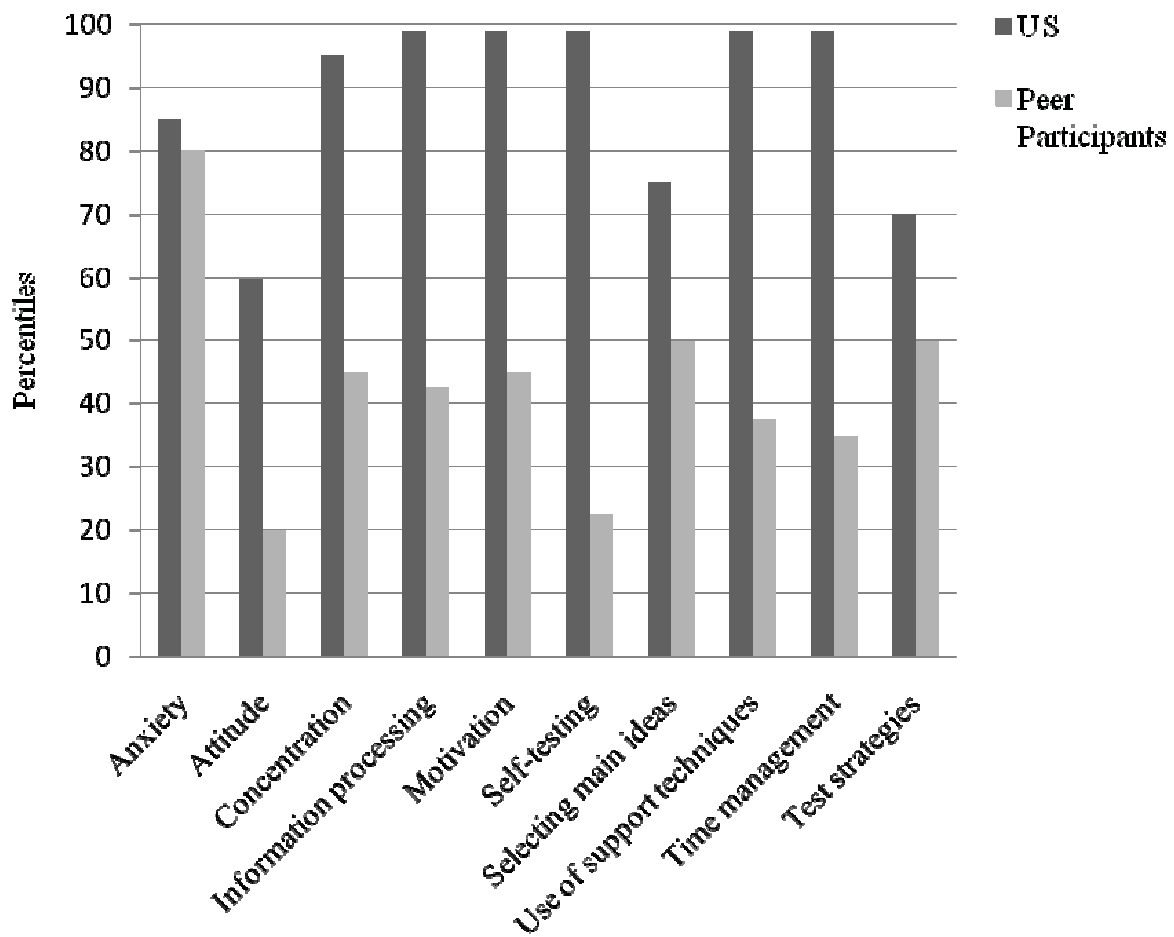


Figure 6. LASSI category percentile scores for US and his associated Peer Participants



she had seen her son's completed LASSI protocol and that his responses did not match her perceptions: "I think many of his answers are way off of what is reality." Some comments from US, however, reinforced that his LASSI scores were in accordance with his self-perceptions – although this still does not confirm the accuracy of those perceptions from other people's perspectives – and other comments from US disconfirmed his LASSI scores.

Confirming evidence about the category of Information Processing came from US's interview comments, while disconfirming evidence came from the comments of those associated with him. For example, US remarked about how well he could gather information from lectures and occasional interactions with fellow students; in contrast, his mother stated:

He can't take lots of pieces of information and process them and organize them, and I think some of that is due to his memory problem. I think if he could remember, he could organize...but he just can't remember long enough to organize it.

Regarding the category of Anxiety and Worry, US's own comments both confirmed and disconfirmed his LASSI score placing him at the 85th percentile. At one point in the interview, US explained his strategy for remaining positive despite academic challenges:

Just having patience and not getting too frustrated, getting too hard on myself when I mess up. And luckily, I was never that much of a person [to get down on myself] prior to my injury, so I overcome those difficulties much easier than other people expect sometimes.

At another point, however, US commented on his disappointment and concern about receiving a lower grade than was typical of his pre-injury performance: "I was pretty distraught for about 2 or 3 days....It was just a little shocking [and] hard to take.

Only disconfirming evidence appeared in the qualitative data corpus regarding US's ability to identify main ideas. Despite obtaining a LASSI score placing him at the 75th percentile for Selecting Main Ideas, both US and his mother talked about his reliance on other people to determine what information to study. For example, US said:

Once a week, or more if I need it, I go to meet with one of my tutors...to work on any homework I have. I assume the head tutor consults with whatever professor I have to get me any study information knowledge that I need to know, so I get it down correctly.

The researchers found only confirming evidence for the categories of Use of Support Techniques and Materials and Test Strategies. Regarding the first category, US's LASSI score placed him at the 99th percentile. US confirmed his effectiveness in accessing available supports by explaining that he utilizes the on-campus tutoring service at least once a week and that he continues to use on a daily basis strategies taught to him during his acute and post-acute rehabilitation. As confirmation of his 75th percentile rating in Test Strategies, US described his studying practices: "Usually, [I] put those [i.e., facts] down on note cards to study....Then, the days between classes, I'm usually just studying my cards for information."

### Cross-case and Mixed Method Results

**Quantitative results.** Cross-case analysis of the quantitative data suggests that three of the four student participants with TBI perceived their study skills and learning strategies in substantially different ways than their same-class peers perceived themselves. Specifically, FM, CC, and US rated themselves as possessing skills superior to those of most of their peers in at least some, if not all, LASSI categories. FM's scores appeared somewhat polarized in that her high scores were well above and her low scores were well below those of her peers. LD was the sole student with TBI to respond to LASSI items in a manner that yielded percentile scores generally comparable to those of her same-class peers.

**Qualitative results.** The four student participants with TBI and the people associated with them made numerous comments about study skills related to the LASSI categories. For each student, comments relating to between five and seven of the ten LASSI categories appeared in their interviews or those of people associated with them as addressed in the first section of the results. With regard to each LASSI category, the data corpuses of two student participants included comments relating to Anxiety and Worry about School Performance; the data corpuses of three student participants included statements about Concentration and Attention to Academic Tasks; Motivation, Diligence,

Self-discipline, and Willingness to Work Hard; and Selecting Main Ideas and Recognizing Important Information; and the data corpuses of all four students with TBI included comments about Information Processing, Acquiring Knowledge, and Reasoning; Use of Support Techniques and Materials; and Test Strategies and Preparation for Tests. None of the qualitative data sets included information about the three remaining LASSI categories: Attitude and Interest; Self-testing, Reviewing, and Preparation for Classes; and Use of Time Management Principles for Academic Tasks.

**Mixed method results.** Cross-case analysis of the mixed method findings revealed confirming and/or disconfirming evidence regarding the seven aforementioned LASSI categories. This evidence came both from the participants with TBI as well as from people associated with them. At times, the qualitative evidence confirmed an area as a relative strength for a student, while, at other times, it confirmed an area as a relative challenge. Likewise, the qualitative data disconfirmed certain areas as relative strengths and/or challenges for various student participants. Table 2 lists the LASSI categories for which confirming and disconfirming evidence existed for all student participants with TBI.

## Discussion

The findings from this research revealed many discrepancies regarding the way student participants with TBI perceived their mastery and utilization of various study skill behaviors. In general, disparities in perception arose in three forms: (a) the students responded to study skills inventory items in a manner suggesting they were more proficient in applying beneficial study habits than was typical of same-class peer participants and college students in general who served as the normative sample for the inventory; (b) the students responded to study skills inventory items in a manner suggesting they were more proficient than other people associated with them perceived them to be; and (c) the students responded to study skills inventory items in a manner that they later contradicted when responding to interview questions. These disparities in perception appear consistent with the tendency for people with TBI to demonstrate limited awareness of their deficits (Sharp, Bye, Llewellyn, & Cusick, 2006; Sherer, Bergloff, et al., 1998). The fact that this altered self-perception was apparent in individuals who were many years post-injury and who had experienced suf-

ficiently good recoveries to pursue college educations substantiates the robustness of this impairment.

Comments from individuals associated with each of the case study participants support the notion that the students with TBI were mistaken in their self-perceptions about academic strengths and challenges. Such misperception is likely to complicate a student's progress through postsecondary education. In particular, being unaware of one's relative strengths and limitations is likely to prohibit consistent implementation of strategies to compensate for areas of weakness. Furthermore, even if a person implements compensatory strategies in certain instances, poor awareness of limitations makes the generalization of those strategies to novel situations unlikely.

Notably, the frequency of learning and study strategy utilization varied substantially across the participants with TBI, and the actual tactics and techniques found most helpful and implemented most consistently differed as well. Specifically, two participants (FM and US) appeared to use compensatory accommodations and strategies routinely and consistently, whereas the other two did not. In particular, LD, CC, and people associated with them reported less than maximal use of accommodations and infrequent communication with people at their institutions who could support their academic progress.

Motivation and diligence emerged as an important factor for three of the four participants. Either the students themselves or those associated with them commented on the ambition these individual's displayed to pursue educational goals. This finding parallels that of Todis and Glang (2008) who reported that, despite reduced course loads and the implementation of accommodation plans, many students with TBI still required high levels of ambition coupled with exceptional effort to achieve success in higher education. Similarly, researchers investigating the behaviors of students with disabilities other than TBI have noted the exceptional time and effort often expended to achieve academic success (Barga, 1996).

With regard to students with TBI, the achievement of postsecondary goals appears to depend not only on individual tenacity but also on the tenacity of professionals working to help individuals develop, modify, and apply compensatory techniques effectively. To be successful, survivors of head injuries routinely draw support from family members, educators, and health care professionals who recognize the importance of

Table 2

*Confirming and Disconfirming Qualitative Evidence Regarding Survivors' Strengths and Challenges across LASSI Categories*

<i>LASSI</i> Category	Strength		Challenge	
	Confirmed	Disconfirmed	Confirmed	Disconfirmed
Anxiety and Worry about School Performance	US	US	LD	
Concentration and Attention to Academic Tasks	FM	FM, CC	LD	
Information Processing, Acquiring Knowledge, and Reasoning	US	FM, LD, CC, US		
Motivation, Diligence, Self-discipline, and Willingness to Work Hard	FM, CC	CC	LD	LD
Selecting Main Ideas and Recognizing Important Information	LD	LD, US	FM	FM
Use of Support Techniques and Materials	FM, LD, CC, US	LD, CC		
Test Strategies and Preparation for Tests	CC, US		FM, LD	

understanding the techniques most likely to foster success in higher education settings. Given such support, at least some individuals with severe brain injury have the potential to progress through college. Concerns persist, however, about the risk of over-accommodating students in an attempt to facilitate their attainment of college degrees (Hux et al., 2009; Todis & Glang, 2008). When success occurs only because of the presence of extensive supports and those supports exceed the standard of being reasonable accommodations as stipulated in the Americans with Disabilities Act (ADA), one must question the value of implementing them in postsecondary settings. Also, such supports may serve to perpetuate an individual's misperceptions about his/her true abilities and lead to disappointment when later attempts to secure and maintain employment repeatedly fail.

### Limitations

Several limitations exist regarding this research. First, the researchers interviewed only students who had sustained severe TBI and important people associated with them. Because of this, generalizing the findings to students with moderate or mild brain injuries is inappropriate. Second, the student participants were not representative of many survivors of severe TBI, because they had made sufficiently good recoveries to make the pursuit of college degrees feasible despite the severity of their initial injuries. Many people who sustain severe TBI have persistent challenges that prevent this level of academic accomplishment. Finally, two of the student participants were male and two were female, which is not representative of the typically male-dominated TBI population.

Another study limitation is the fact that the student participants with TBI attended different types of higher education institutions—that is, both FM and LD attended large universities in urban settings; US attended a small, private university in a small community familiar to him from before his injury; and CC took classes in a community college setting. This diversity of higher education institutions may have increased the likelihood for inconsistencies to emerge across participants. In particular, this diversity may have affected the findings because of differences in class size, program rigor, or individual course difficulty. The researchers did not question student participants about reasons for selecting specific postsecondary institutions; pursuit of such information might have revealed additional contributors to variability across participants.

A final limitation of this study concerns the nature of the LASSI as a self-report measure of study skills and strategies. Self-report measures are inherently subjective, and, hence, establishing that respondents interpret and reply to statements accurately and truthfully is difficult. This is particularly noteworthy given that people with brain injuries are notorious for displaying limited awareness of their challenges (Sharp et al., 2006; Sherer, Bergloff et al., 1998). Finally, the LASSI results of the students' same-class peers did not match the middle range of the normative sample given for the LASSI, indicating that the LASSI normative data may not accurately represent those who participated in this study.

### **Recommendations**

Administration of a study skills inventory to students with TBI and interviewing them about their perceptions of study skill strengths and challenges may prove beneficial to the professionals providing support as they progress through postsecondary education. Three of the four case participants in this study responded to items on the study skills inventory that were quite distinct from their peer participants' responses, and all four made conflicting comments when interviewed by the researchers. Elicitation of unusual responses to study skill inventory items – especially ones resulting in elevated percentile ratings in comparison to other students without disabilities – can serve as a signal that the student with TBI has inaccurate perceptions about his/her abilities. The co-occurrence of unusual ratings with apparently contradictory verbal comments from a student with TBI is further evidence

that limited awareness of deficits may interfere with his/her effective implementation and generalization of compensatory strategies.

Several study participants generated ideas and comments about formal and informal strategies and accommodations that may help students with TBI progress through college and may help support personnel in implementing assistance for such students. Most notable were suggestions regarding a mentoring program for undergraduates with TBI and incorporation of a first semester course to educate students with brain injuries about study skills and strategies. In a similar vein, establishment of a campus-sponsored brain injury organization may prove beneficial both for students with TBI and the educators who work with them. This contention is supported by Chinn's (2009) report that student officers felt participation in such an organization at Santa Rosa Junior College helped instill a sense of confidence in its members while also helping them form realistic views of their capabilities. Active involvement in groups and organizations also fosters academic perseverance (Tinto, 1999), a positive outcome considering that students with disabilities are less likely to earn college degrees than students without disabilities (deFur, Getzel, & Trossi, 1996).

Additional noteworthy recommendations student participants generated to help other college students with TBI included taking small course loads; talking to individual teachers at the beginning of each semester; making use of formal accommodations and services through the college or university's Students with Disabilities Office; making use of additional support strategies such as planners, study guides, and class handouts or outlines; and utilizing institutional support systems as well as support people in a survivor's life.



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## About the Authors

Erin Bush received her BA degree in psychology and her BS degree in speech-language pathology from the University of Wyoming. She earned her MS Ed at the University of Nebraska – Kearney. She is currently an assistant professor in the Department of Communication Disorders at the University of Nebraska – Kearney and a doctoral student at the University of Nebraska – Lincoln. She is concluding her dissertation, which focuses on the vocational experiences of survivors of traumatic brain injury. She can be reached by email at: bushej@unk.edu.

Karen Hux received her Ph.D. in speech-language pathology from Northwestern University. She is currently a professor in the Department of Special Education and Communication Disorders at the University of Nebraska – Lincoln. Her research focuses on the cognitive and communication challenges associated with acquired brain injury. She can be reached by email at: khux1@unl.edu.

Samantha Zickefoose received her Bachelor of Science degree in Speech-Language Pathology from the University of Nebraska-Lincoln. She is currently a Master's student in the Department of Communication Disorders and intends to earn a doctorate degree. Her research interests include cognitive-communication deficits secondary to acquired neurological impairment. She can be reached by email at: samanthawrenz@huskers.unl.edu.

Gina Simanek, LMHP, MA, received her MA degree in clinical psychology from Washburn University, Topeka, Kansas. Her experience includes working as a mental health counselor within various mental health clinics and facilitating brain injury support groups both in Kansas and Nebraska as well as providing outreach services to brain injury survivors and their families to assure continuum of care. She is currently a grant coordinator at the University of Nebraska – Lincoln which prepares speech-language pathologists to serve students with traumatic brain injury. In her spare time, she continues her outreach work, gives presentations on brain injury and mental health topics, and is getting a 'Brain Injury Community Center' started in the Midwest. Gina can be reached by email at: gsimanek@neb.rr.com

Michelle Holmberg received her BA and MA degrees in speech-language pathology from the University of Nebraska – Lincoln. Her experience includes working as a school speech-language pathologist for Lincoln Public Schools and serving students with autism, visual impairments, and specific learning/language disabilities. During her undergraduate and graduate studies, she researched study strategies used with students with traumatic brain injury. She can be reached by email at: [mholmbe@lps.org](mailto:mholmbe@lps.org)

Ambyr Henderson received her BS degree in Speech Language and Hearing Sciences from the University of Wyoming and MS degree in Speech-Language Pathology from the University of Nebraska-Lincoln. Her experience includes working as a speech-language pathologist for the Lincoln Public Schools and serving a diverse population of students from preschool-fifth grade. She has recently accepted a position as a speech-language pathologist for the Urbana School District in Champaign-Urbana, Illinois. Her research interests include community outreach and education about speech-language and hearing impairments with an emphasis on traumatic brain injury. She can be reached by email at: [ambyr.henderson@gmail.com](mailto:ambyr.henderson@gmail.com)