

THE RELATIONSHIP BETWEEN BRAIN INJURY AND THE PROVISION OF SCHOOL SERVICES

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ABSTRACT

The purpose of this study was to determine whether students identified as having brain injury were receiving Section 504 or special education services and, if so, under which disability category were special education services being provided. The participants were parents of students who were enrolled in grades 1–12 during the 2001–2002 school year. Two samples were drawn using a computer-generated sampling technique. Sample 1 consisted of all students in the school population and Sample 2 consisted of only those students who received special education services. Parents completed a questionnaire regarding their child's medical, physical, and school behavior. Data were analyzed using chi-square statistics and descriptive analysis. Results suggest that students with brain injury are less likely to receive Section 504 services and also are less likely to receive special education services under the disability category of Traumatic Brain Injury.

INTRODUCTION

Prior to 1990, brain injury was not recognized by the Federal Government as a disability category in special education. As a result, many children who had a brain injury and experienced various cognitive, emotional, behavioral, or physical difficulties were often misidentified as having other types of disabilities or were not identified at all (Graham, Tognazzini, & Lyons-Holden,

1996). Children who were inappropriately identified as having learning disabilities, emotional disabilities, or severe cognitive disabilities were frequently placed in programs designed to address the characteristics of those particular disabilities (Graham, Tognazzini, & Lyons-Holden, 1996).

In 1990, Congress amended the Individuals with Disabilities Education Act (P.L. 101-476) to include the disability category of Traumatic Brain Injury. With this adoption, students who were identified as having traumatic brain injury and needing special education services were now eligible to receive those services under this disability category. The Individuals with Disabilities Act 1990 defined Traumatic Brain Injury as:

an acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment, or both, that adversely affects a child's educational performance. The term applies to open and closed head injuries resulting in impairments in one or more areas, such as: cognition; language; memory; attention; reasoning; abstract thinking; judgment; problem-solving; sensory, perceptual, and motor abilities; psychosocial behavior; physical functions; information processing; and speech. The term does not apply to brain injuries that are congenital or degenerative, or brain injuries induced by birth trauma. [Code of Federal Regulations, Title 34, § 300.7(b)(121)]

Another school support service available for students with brain injury is Section 504 of the Rehabilitation Act of 1973, P.L. 93-112 (29 U.S.C., sec. 794). This Act protects individuals with disabilities from being discriminated against or excluded from any program or activity receiving federal funding (Heward, 2006). Since public schools rely on federal monies, school programs and activities must be accessible to all students who have disabilities. Unlike the Individuals with Disabilities Education Act, Section 504 is a regular education initiative and not a special education support. Students, who may not be eligible for special education services, may still receive support through Section 504.

Although brain injury is continually reported as the leading cause of death and disability among children and adolescents (Centers for Disease Control and Prevention, 2003), this fact is not reflected in the number of students receiving special education services under the disability category of Traumatic Brain Injury. In the *23rd Annual Report to Congress*, the U.S. Department of Education's Office of Special Education Programs (2001) reported that 5,683,707 children between the ages of 6-21 were served under

Part B of the Individuals with Disabilities Education Act. These numbers reflect the reporting from the 50 states, District of Columbia, and Puerto Rico for the 1999–2000 school year. Of the over 5 million children receiving services, only 13,874 children were assigned the disability category of Traumatic Brain Injury. According to these numbers, only approximately .2441% of the total student population receiving special education services is identified as having traumatic brain injury. These data raise many questions regarding present-day brain injury identification issues within schools.

Despite the adoption of the Traumatic Brain Injury disability category over fifteen years ago, concerns regarding the accurate identification of students with brain injuries, the appropriateness of services and supports being provided, and the many unidentified students with brain injuries not receiving support and services within schools continue to exist (Bergman, 1999).

As students with brain injury often display characteristics that are indicative of other types of disabilities, the possibility that school personnel do not recognize their true disability remains. In addition to receiving inappropriate services due to misidentification, some students may not receive services at all (Janus, 1994). These students may have received special education testing through their schools, but their scores may have fallen within normal ranges, which deem them ineligible for special education services. Having “tested-out” for special education services, students are then often mistakenly described as lazy or unmotivated (Glang, Wong, Allen, & Tyler, 2000).

The designation of Traumatic Brain Injury as a specific disability category under the Individuals with Disabilities Education Act 1990 occurred so that students with brain injury would receive appropriate services within the school setting. A strong literature base exists supporting the need for differential diagnosis as well as appropriate instruction and support for students with brain injury (Janus, 1994; Pasino, 1996). The need for differential diagnosis is not to teach to the disability label, but to be knowledgeable of the many complex issues associated with childhood brain injury and to support each student individually (Hibbard, Brown & Gordon, 1999).

Brain injury is still considered a relatively new area to the field of special education. Although a limited amount of research has been conducted to explore the issues associated with the identification of students with brain injuries within the education system, the literature does suggest that misidentification may lead to inadequate educational services (Cantor, Gordon, Schwartz, Charatz, Ashman, & Abramowitz, 2004). A purpose of this study was to gain an understanding of brain injury identification, misidentification, and non-identification issues within the school system.

Using a survey format, data were gathered from a proportional stratified random sample of parents of children in the first through twelfth grades in three Colorado school districts. The survey's questions broadly attempted to assess the possibility that a student had a brain injury, whether the child was receiving Section 504 supports or special education services and under which disability category were special education services provided. Although Section 504 plans are the responsibility of general education and not special education, this issue is of interest as many students with brain injury may only require general education supports to be successful.

METHODS

The instrument used for this study was the Student Indicator Survey. It was developed for parent-use; it was originally designed as a preliminary screening tool to indicate areas of potential brain injury in children (Center for Community Participation, 2000). It is not a diagnostic tool that can be used to establish the presence of a brain injury. Its purpose is to indicate the possibility that a brain injury may exist and that further investigation is warranted.

The survey is comprised of eleven questions, four of which are constructed of several parts. For the purpose of this article, the key components of this survey are questions: 2f, 9, and 11. Question 2f identifies the child as having or not having a brain injury; question 9 identifies the child as receiving Section 504 services; and question 11 identifies the disability category under which the child is receiving special education services.

Surveys for the three districts were color coded to reflect each of the districts. Surveys used specifically for the special education sample contained a graphic bordering the survey title. The graphic assisted in the separation and organization of the two samples. A follow-up packet was mailed to participants ten days later.

Each potential participant was mailed this survey in a packet, which also contained a letter explaining the study and requesting parental participation and a stamped, addressed return envelope.

PARTICIPANTS

Potential participants were parents of children in grades 1–12 in three Colorado school districts during the 2001–2002 school year. Two proportional, stratified random samples were used for this study. The first sample, Sample 1, was drawn from all students in the school population so that the

sample accurately represented the demographics of the school districts, including accurate representation of children who were in general education and/or receiving special education services. A total of 3,564 surveys were sent in Sample 1. Of this number, 923 surveys were returned yielding a 27% response rate for Sample 1. The second sample, Sample 2, was drawn from students who received special education services. Of the 1,866 surveys sent in Sample 2, 374 surveys were returned, yielding a 21% return rate for Sample 2. The two separate samples were necessary to address the study's research questions.

RESULTS

The first topic of interest was whether students with brain injury were receiving Section 504 plan services. To address this question, Sample 1 data, the general population sample, were used in this analysis. The analysis was guided by the following research question:

Research Question 1: Are students who meet the criteria of brain injury and are having difficulty in school receiving Section 504 plan services?

To provide an answer to this research question, three survey items were taken into consideration: Has your child been identified as having a brain injury, is your child experiencing difficulty in school, and is your child receiving Section 504 plan services.

Although 24 students were reported as having a brain injury, only two surveys contained information regarding whether their child was experiencing difficulty in school. For this reason, difficulty in school could not be considered when completing this analysis. However, this research question could still be addressed using the two other items of interest.

Table 1 shows that of the 818 survey responses for this question, 801 students were not identified as having a brain injury. Of this number, 25 students (3%) were reported as receiving Section 504 plan services. Of the 818 responses for this question, 17 students were identified as having a brain injury and of these, 3 students (18%) were receiving Section 504 plan services. To determine if a statistical difference exists between students identified and not identified as having brain injury and the provision of Section 504 services, a chi-square test was performed. Through chi-square analysis, it was determined that a statistical difference does exist, $\chi^2 (1, n = 818) = 10.6$,

TABLE 1
Sample 1: Brain Injury and 504 Plan Services

Sample 1	Not Receiving 504 Plan Services (% of Total Sample)	Receiving 504 Plan Services (% of Total Sample)	Total (%)
Not identified as having brain injury	776 (95)	25 (3)	801 (98)
Identified as having brain injury	14 (2)	3 (.4)	17 (2)
Total	790 (97)	28 (3)	818 (100)

$$\chi^2 (1, n = 818) = 10.6, p < .0011$$

$p < .0011$. It is important to note that chi-square may not be a valid test, as 25% of the cells have expected counts less than 5.

To further explore this question, a Goodness of Fit test was performed to determine if a statistical difference exists only between those students identified as having a brain injury who were and were not being provided Section 504 plan services. As shown in Table 2, the results suggest that this difference is significant, $\chi^2 (1, n = 17) = 7.12, p = .05$.

BRAIN INJURY AND SPECIAL EDUCATION SERVICES

This study was concerned with not only whether students with brain injury were receiving Section 504 plan services, but also if students with brain injury were receiving special education services. The following research question was used to guide the data analysis process.

TABLE 2
Sample 1: Goodness of Fit Test, Identified Brain Injury and 504 Plan Services

Sample 1	Not Receiving 504 Plan Services	Receiving 504 Plan Services	Total (%)
Identified as having brain injury	14 (82)	3 (18)	17 (100)

Research Question 2 Are students who meet the criteria of brain injury and having difficulty in school receiving special education services?

Sample 1, the general population sample, was the primary sample used to answer this question. The survey items that were designed to answer this research question were: Has your child ever been identified as having a brain injury, is your child experiencing difficulty in school, and is your child currently receiving special education services.

Of the 24 students identified as having a brain injury, there were 23 responses containing information regarding special education services. Of these 23 students, experiencing difficulty in school was reported only for two. With only two responses to this item, there are insufficient data for considering difficulty in school as a contributor in this analysis. However, the two remaining items—has your child ever been identified as having a brain injury and is your child currently receiving special education services—still provide a relevant answer to the research question.

Table 3 shows that there were 888 students who were not identified as having a brain injury and of these, 56 (6%) students were receiving special education services. In contrast, there were 23 students with brain injury and of these, 10 (43%) were receiving services. A chi-square test was used to determine if a statistical difference exists between students identified and not identified as having brain injury and the provision of special education ser-

TABLE 3
Sample 1: Brain Injury and Special Education Services

Sample 1	Not Receiving Special Education Services (% of Total Sample)	Receiving Special Education Services (% of Total Sample)	Total (%)
Not identified as having brain injury	832 (91)	56 (6)	888 (97)
Identified as having brain injury	13 (2)	10 (1)	23 (3)
Total	845 (93)	66 (7)	911 (100)

$\chi^2 (1, n = 911) = 46.1, p < .0001$.

vices. The chi-square analysis revealed that a significant difference does exist, $\chi^2 (1, n = 911) = 46.1, p < .0001$.

A Goodness of Fit test was next applied to just those students with a brain injury. Of the 23 students identified as having brain injury, 10 students (43%) were reported as receiving special education services and 13 students (57%) were reported as not receiving services. The Goodness of Fit analysis, shown in Table 4, indicates that a significant difference does not exist, $\chi^2 (1, n = 23) = .39, p > .05$.

BRAIN INJURY AND SPECIAL EDUCATION DISABILITY CATEGORY

As discussed previously, students with brain injury often do not receive special education services under the Traumatic Brain Injury disability category. Data regarding brain injury and disability category were analyzed to explore this issue and answer the following research question:

Research Question 3: What is the assigned disability category of students who meet the criteria of brain injury and who receive special education services?

The data from Sample 2 were used to answer this research question. The survey items that were designed to answer this question were: Has your child been identified as having a brain injury, and is your child receiving special education services and, if so, under which disability category (ies).

To explore the research question, a descriptive analysis was conducted of the proportions of students being served under the special education disability categories. Of the 374 surveys in Sample 2, 49 parent responses indicated that their child had been identified as having a brain injury; however only 40 of those 49 parents reported a disability category. Table 5 shows the percent-

TABLE 4
Sample 1: Goodness of Fit Test, Identified Brain Injury and Special Education Services

Sample 1	Not Receiving Special Education Services	Receiving Special Education Services	Total (%)
Identified as having brain injury	13 (57)	10 (43)	23 (100)

$\chi^2 (1, n = 23) = .39, p > .05$

TABLE 5
Sample 2: Brain Injury and Special Education Disability Category

	Special Education Category	Identified as Having Brain Injury (%)	Cumulative Total (%)	
Single Category	Other (O)	9 (18)	9 (18)	
	Speech-Language Disability (S/L)	5 (10)	14 (28)	
	Physical Disability (PD)	3 (6)	17 (34)	
	Multiple Disabilities (MD)	2 (4)	19 (38)	
	Significant Identifiable Emotional Disability (SIED)	1 (2)	20 (40)	
	Significant Limited Intellectual Capacity (SLIC)	1 (2)	21 (42)	
	Traumatic Brain Injury (TBI)	1 (2)	22 (44)	
	Perceptual or Communicative Disability (PCD)	0	22 (44)	
	More than One Category	PCD, SL	3 (6)	25 (50)
		PD, O	2 (4)	27 (54)
SLIC, SIED		2 (4)	29 (58)	
SLIC, PD		1 (2)	30 (60)	
SLIC, SIED, MD		1 (2)	31 (62)	
SLIC, SIED, PCD, SL		1 (2)	32 (64)	
SLIC, SIED, PCD, MD, PD		1 (2)	33 (66)	
SLIC, SIED, SL, PD		1 (2)	34 (68)	
SLIC, PCD, MD, PD, TBI		1 (2)	35 (70)	
PCD, SL, MD		1 (2)	36 (72)	
PCD, PD, TBI		1 (2)	37 (74)	
MD, PD		1 (2)	38 (76)	
MD, TBI		1 (2)	39 (78)	
TBI, O		1 (2)	40 (80)	
No Response	9 (18)	49 (98)		
Total	49	100		

ages of students, identified as having brain injury, who are receiving services under the special education disability categories provided in the survey.

In interpreting these data, there are two important caveats. First, parents were asked to mark all of the disability categories for which their child was receiving services and not just the primary disability category. Second, although the “Other” category includes disability areas such as the sensory impairments (e.g., vision), parents may also have marked “Other” when they were unaware of the specific disability category being used by the district for their child.

That having been said, Table 5 shows that of the 40 students who were identified as having a brain injury, only 5 of them (13%) were reported as receiving special education services under the Traumatic Brain Injury disability category. Furthermore, 4 of those 5 students were also reported as receiving services under additional disability categories. Students with brain injury who were reported as receiving special education services under only one disability category were more often receiving those services under the disability categories of “Other,” Speech-Language, and Physical Disabilities. Students who were reported as receiving services under more than one disability category were more often reported as receiving services under the disability category of Significant Limited Intellectual Capacity.

REVIEW OF FINDINGS

This study explored issues of brain injury identification and the provision of school services. The three research questions used to investigate these issues were analyzed through quantitative statistics. Two of the research questions addressed issues regarding the provision of school services, and the remaining research question focused on the disability category under which students were receiving services.

A topic of interest in this study was whether students with brain injury were receiving Section 504 plan services. When analyzing the data for only those students with a brain injury, the Goodness of Fit analysis suggested that students with brain injury were more likely not to be receiving Section 504 plan services than to be receiving those services.

Another main focus was to determine if students with brain injury were receiving special education services. In terms of whether students with brain injury were or were not receiving services in relation to the general population, there was a significant difference suggesting that students with brain injury were more likely to be receiving special education services. However, when only those students with brain injury were examined, the results sug-

gest that there was not a significant difference between students with brain injury receiving and not receiving special education services. In other words, if one had a brain injury the probability of receiving special education services was no greater than the probability of not receiving services.

With respect to the type of services students received, most of the students who had been identified as having a brain injury and receiving special education services were not receiving those services under the disability category of Traumatic Brain Injury. The majority of students who had identified brain injuries were receiving special education services under the disability categories of "Other," Speech-Language, and Physical Disability. In the cases of more than one reported disability category, students were more often reported as receiving services under the disability category of Significant Limited Intellectual Capacity.

DISCUSSION

As mentioned, a focal interest of this study was to determine if students who had been identified as having a brain injury were receiving Section 504 plan or special education services. These two research issues were examined using the Sample 1 data.

BRAIN INJURY AND SECTION 504 SERVICES

The analysis of the Section 504 data clearly indicates that such plans are seldom used. Although the initial statistical analysis was inconclusive because of insufficient data, the results of the second analysis are very clear. These results suggest that students with brain injury were more likely not to be receiving Section 504 services than to be receiving services. This information, in itself, is interesting. Services provided under Section 504 represent an especially powerful way to support students through general education services. Since so few parents reported that their children were receiving Section 504 plan services, it may mean that schools are not informing parents of this support service. Although this study only touched on the issue of Section 504 services, the study's results propose that a need exists to explore this issue further.

BRAIN INJURY AND SPECIAL EDUCATION SERVICES

This foregoing finding becomes even more prominent when one examines the data provided by this study with respect to students with brain injury and the use of special education services. Two analyses were conducted to deter-

mine whether students with brain injury were receiving special education services. In the first analysis, the results suggest that students with brain injury were more likely than the general population to receive special education services. However, the results of the second analysis suggest that there was not a significant difference between students with brain injury receiving and not receiving special education services. In other words, especially given that the proportion of students with brain injury not receiving services was higher than the proportion of students with brain injury receiving services, this second analysis brings in to question whether students with brain injury are truly receiving the support that they need.

Taking into account this study's results with respect to Section 504 and special education services, almost half of the students identified as having a brain injury were not receiving any type of support. These results expand the existing literature base. Bergman (1999) asserts that individuals with brain injury are "underserved."

It is, of course, possible that some of these students do not require either Section 504 or special education support. It is also important to note that the appropriateness of the service being provided by the schools was not addressed in this study. Additional research is required if a more complete picture of these patterns is to be developed.

BRAIN INJURY AND DISABILITY CATEGORY

The study suggests that there were students with brain injury who were receiving special education services. Therefore, the second area of interest was determining under which of the special education disability categories students with brain injury were receiving those services. The data from Sample 2, the special education sample, were used to explore this issue.

Since the inclusion of Traumatic Brain Injury as a special education disability category in 1990, concerns have arisen as to whether students with brain injury are being accurately identified and receiving special education services under the Traumatic Brain Injury disability category. Students with brain injury may require specialized services and supports and, therefore, there is a need for appropriate identification. Bergman (1999) points out that there is a discrepancy between the numbers of students who sustain a brain injury each year and the numbers of students who receive special education services under the Traumatic Brain Injury disability category.

This study supports Bergman's findings. According to parent reports, students who were identified as receiving services were infrequently receiving those services under the disability category of Traumatic Brain Injury. In fact, in the analysis of students reported as having brain injury, students were less

likely to be receiving services under the disability category of Traumatic Brain Injury than under other disability categories. The most frequently identified disability categories in the analysis were "Other," followed by Speech-Language. Students with brain injury receiving services under more than one disability category were more often reported as receiving those services under Significant Limited Intellectual Capacity.

These findings corroborate research suggesting students with brain injuries often do not receive services under the disability category of Traumatic Brain Injury. Ylvisaker, Szekeres, and Hartwick (1994) state that students with brain injury are often misidentified as having other types of disabilities. Cantor et. al. (2004) further asserts that students with brain injury are frequently misdiagnosed as having a cognitive, learning, or emotional/behavioral disability. The present study's results tend to confirm the position of the literature on this matter.

FUTURE DIRECTIONS

It is recommended that further research similar to the present study be conducted to establish a research base on which to make judgments regarding special education services for students with brain injury. As this is a relatively new area, there is not an established strong foundation of research. Studies of this nature can only add to the existing research base.

Additionally, studies such as Chapman's (2002), exploring teachers' perceptions of their ability to work with students with brain injury, need to be conducted on a larger scale. Teachers, both general education and special education, need to assess their comfort level and ability to work with students with brain injury. This information can then identify gaps in teacher training programs that will effect change.

Although most teacher training programs include information on brain injury, it is often only to a limited extent. Although childhood brain injury is unique from other types of disabilities, it is often not emphasized as its own type of disability. Teacher preparation programs need to educate professionals on brain injury identification and support issues. As with assessing educator knowledge of childhood brain injury, research may be necessary to determine university professors' knowledge in this area. Research needs to be conducted of teacher-training programs to determine the quality of brain injury information that is being provided, as well as offer suggestions that could lead to more comprehensive teacher preparation.

The accurate identification and support for students with brain injury is critical to a student's overall educational success. The educational system

would benefit from a pre-screening process that helps identify the possibility of a brain injury and suggests options for further evaluation when needed. In order for this initial screening to occur, the educational team must have a method to gain pertinent student history. A pre-screening tool, such as the one used for this study, could provide insightful parent-given background information. Instruments such as this one should be investigated further for their effectiveness, and then provided to schools, along with training, to use as a pre-screening instrument for brain injury.

The education goal for all children is to learn. Through acknowledging specific barriers to learning, the educational system can then take a solution-focused approach to supporting students. The educational system must be a dynamic system that constantly changes as new challenges arise. As our understanding of students' needs grow, the educational system must also grow and adapt to meet these needs.

SUMMARY

The field of brain injury is relatively new. Schools are supporting an increasing number of students with brain injury and are learning how to best meet the needs of these students. Although this field has made tremendous strides, there is still much to do. As discussed, the education system must adopt a pre-screening process for identifying students with brain injury, as well as provide comprehensive services to meet their needs. In order to better prepare the nation's educators, teacher preparation programs need to confront and address the issues of brain injury identification, non-identification, and misidentification in the schools. The current educational system must work with researchers, teacher-training programs, and families to better understand and support the learning of all students—including those with brain injury.

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