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Do children who sustain traumatic brain injury in early childhood need and receive academic services 7 years post-injury?

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Abstract

Objective—Examine the prevalence of academic need, academic service utilization, and unmet need as well as factors associated with academic service utilization 6.8 years after traumatic brain injury (TBI) in early childhood.

Method—58 (16 severe, 42 moderate) children with TBI and 72 children with orthopedic injury (OI) completed the long-term follow-up 6.8 years after injury in early childhood (ages 3–7 years). Injury group differences in rates of need for academic services, academic service utilization, and unmet need as well as factors associated with service utilization and unmet need were examined.

Results—Students with TBI (both moderate and severe) had significantly greater rates of need than those with OI. A greater proportion of the severe TBI sample were receiving academic services at long-term follow-up than other injury groups; however, among those with an identified need, injury group did not affect academic service utilization. Below average IQ/Achievement

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scores was the only area of need predictive of academic service utilization. Rate of unmet need was high across injury groups (46.2%–63.0%); with rates in the moderate TBI group greater than the OI group (although similar to the severe TBI group).

Conclusion—There is a high need for academic services among patients with a history of TBI during the preschool years 6.8 years post injury. Findings underscore the importance of continued monitoring of behaviors and academic performance in students with a history of early childhood TBI. This may be especially true among children with less severe injuries who are at risk for being underserved.

Keywords

Pediatric TBI; academic service; service utilization

Traumatic brain injury (TBI) in children 14 years of age and younger results in 2,685 deaths, 37,000 hospitalizations, and 435,000 emergency department visits annually in the United States¹, making it one of the leading causes of morbidity and mortality in childhood, and the most common source of acquired disability in children². Brain injury sustained during childhood can negatively impact a wide-array of functional domains, often resulting in impairments in memory^{3–5}, intellectual functioning^{4,6,7}, behavior^{3,8–11}, executive functioning and attention^{12–17}, social interaction^{18–20}, and academic performance^{7,9,21–23}.

Among the variety of domains that may be impacted following TBI are school functioning and academic performance^{24–28}. TBIs during childhood occur during a very dynamic period of development, so this population is at risk not only of losing already mastered skills but also of having increased difficulties acquiring new information and developing skills in the future^{25,29,30}. The neurocognitive effects of TBI may worsen over time as children progress through grades and increasing demands are placed on sustained attention, executive function and organizational skills, socialization skills, and the ability to integrate information and make inferences. Additionally, support from teachers diminishes with increasing age and responsibility for successful completion of school work falls more squarely on the student. Consequently, researchers have described emerging deficits following early TBI that only become apparent as intellectual demands increase and environmental supports decrease²⁹.

Longitudinal studies have shown that behavioral, cognitive, and academic difficulties following TBI frequently persist or worsen as over time after TBI^{4,7,23,24,30,31}. Moreover, greater deficits are reported for those with a history of severe injury²⁴ and those injured at a younger age^{23,24,30,31}. Further, academic difficulties appear to persist despite some recovery in cognitive functioning. Jaffe, Polissar, Fay, & Liao³² investigated the rate of recovery over a three-year period in children with mild, moderate, and severe TBI. Results from a standardized battery of academic tests revealed plateauing of recovery, such that improvement in academic performance slows following the first year post-injury, leaving many children who sustained a moderate or severe TBI unlikely to catch up with their typically-developing peers. Some authors have hypothesized that skills acquired prior to injury may be less vulnerable to effects of TBI^{31,33}, with the greatest impairment noted in academic skills introduced after injury. Regardless of the source of impairment, children with TBI are likely to have academic, behavioral, and social impairments in school that may

require supports to promote success. Hawley³⁴ found that parents of children with mild to severe TBI reported more school problems than parents of healthy controls, even 2 years post injury; however, studies examining the long-term trajectory of academic services for children following TBI in early childhood are limited.

Despite the clear need for long-term supports within the classroom setting^{28,35,36}, relatively little is known about long-term service utilization 5 or more years post-injury, with most studies reporting on services attained closer to the time of injury. Glang et al.²¹ found that in a sample of 56 children and adolescents who had sustained a TBI, less than half of those with severe TBI and less than 7% of those with mild to moderate TBI received formal services (i.e., an IEP or 504 plan), with approximately one-third receiving no services upon returning to school. Increased severity of injury, parental concerns about social/behavioral and speech language problems, parental requests for services, and hospital to school transition services were all positively correlated with receipt of formal educational services. Likewise, Kinsella et al.³⁷ found that children with more severe TBI had higher rates of transition from regular to special education two years post-injury. Similarly, Taylor and colleagues³⁸ found higher rates of special education among school-aged children with severe TBI compared to children with orthopedic injuries at six months, 12 months, and an extended follow-up approximately 4.1 years post-injury. Importantly, Taylor et al.³⁸ found that new placements in special education were rare after the first year following injury. Taken together, these findings raise the possibility that children with emerging needs over time after TBI are at risk of not receiving needed academic services several years post-injury.

Previous work has focused on academic outcomes following injury in school-aged children with little known about the academic outcomes of children injured in early childhood (i.e., preschool years). Reports that earlier age of injury is associated with poorer long term outcomes^{24,30} together with the theory that younger children have mastered fewer skills (robust to effects of injury) prior to injury³¹ make children who sustain a TBI in during the preschool years an exceptionally vulnerable group. The present study sought to investigate the prevalence of academic need, receipt of academic services, and rate of unmet academic need 6.8 years following early childhood TBI. We report findings from a prospective longitudinal follow-up study using data collected approximately 6.8 years following injury in a large cohort of children who sustained either a severe TBI, moderate TBI, or orthopedic injury. We also evaluated factors at long-term follow-up that were associated with receipt of services and unmet need within the school setting. We aimed to better understand the potential need within the school setting, and identify predictors for receiving academic services in order to elucidate possible avenues for decreasing long-term unmet academic needs following early TBI.

METHODS

Participants

The current sample was part of a longitudinal concurrent cohort/prospective study of outcomes in children following TBI during early childhood (preschool years) who completed a long-term follow-up assessment an average of 6.8 years post injury³⁹. The

timing of this long-term follow-up was designed to coincide with the entrance into middle school/early adolescence, a time for increased demands for self-regulation, organization, and higher order thinking skills, rather than a specific time since injury. Children and their families were enrolled at the time of injury. Consecutive admissions of children between the ages of 3 and 7 years with TBI or orthopedic injury (OI) that did not involve the central nervous system were screened at level one trauma centers at three children's hospitals and one general hospital. Children hospitalized for OI were recruited as a comparison group to control for child and family characteristics that predispose children to traumatic injuries⁴⁰. Additional inclusion criteria included overnight hospitalization, accidental cause of injury, no history of pre-injury neurological problems or developmental delays, and English as the primary spoken language. TBI severity was characterized using the lowest post resuscitation Glasgow Coma Scale (GCS) score. Severe TBI was defined as GCS score less than or equal to 8. Moderate TBI was defined as GCS score of 9–12 or 13–15 accompanied by TBI-related abnormality on brain imaging. The OI group included children who sustained a bone fracture (not including skull fractures), had an overnight stay in the hospital, and did not exhibit alterations in consciousness or other signs or symptoms of head trauma or brain injury.

Procedure

All aspects of this study were approved by the institutional review board at each of the four study sites and written informed consent was provided by the parents or legal guardian once the child was known to be in stable medical condition. Demographic and injury-related information was collected at the initial baseline assessment. Most participants were in middle school at the long term follow-up assessment, at which time primary caregivers and teachers completed standardized measures assessing child and family functioning and participants completed a battery of tests assessing intelligence and academic achievement. Utilization of academic services was assessed at the long-term follow-up by asking parents and teachers if the child was currently receiving accommodations through an Individualized Education Program (IEP services) or under Section 504 of the Rehabilitation Act of 1973 (504 services). Additionally, teachers were asked if the child was receiving any specialized support or instruction in school. If the teacher or parent reported that the child was receiving any of these services, the participant was coded as currently receiving academic services. Teacher rating scales were difficult to obtain, and only 78 children had valid teacher reports. Children with teacher ratings differed from those without teacher ratings in terms of age, SES, and race. Factors associated with significantly higher rates of teacher ratings at long-term follow-up were younger age, white race, higher SES, and lower parent ratings of internalizing symptoms.

Measures

Tests of Intelligence and Academic Achievement

Wechsler Abbreviated Scale of Intelligence (WASI⁴¹): The WASI is an abbreviated standardized measure contains four subtests and provides a reliable and valid estimate of full-scale IQ. A standard score <80 was used as an indicator of potential need.

Woodcock Johnson Test of Achievement, Third Edition (WJ-III⁴²): The WJ-III is a standardized measure of academic achievement with well-established reliability and validity. At the long-term follow-up, participants were administered the Letter-Word Identification, Calculation, and Written Expression subtests from the WJ-III. A standard score of <80 on any of the subtests was used as an indicator of potential clinical need.

Parent- and Teacher-Ratings of Behavior and Executive Function

Child Behavior Checklist 6–18 (CBCL⁴³): The CBCL is a parent-report measure of child emotional and behavioral problems. It has high test-retest reliability and criterion validity and has been shown to be sensitive to behavior problems following TBI^{11,44}. The Total Problem Score as well as selected DSM oriented scales (Affect, Anxiety, ADHD, and ODD) were used to determine potential need for service.

Teacher Report Form (TRF⁴³): The TRF is a teacher-report measure of child emotional and behavioral problems within the school setting that elicits ratings similar to those on the CBCL. Again, the Total Problems Score as well as selected DSM-oriented scales (Affect, Anxiety, ADHD, and ODD) were used to determine potential need. The correlation between parent and teacher reports of child behavior ranged from .29-.45, consistent with existing literature^{45,46}.

Behavior Rating Inventory of Executive Functioning- Global Executive Composite (BRIEF-GEC⁴⁷): The BRIEF is a standardized rating scale that assesses executive function skills in a child's everyday activities in the home and school environments, and has been used to investigate executive function of individuals following a TBI⁴⁸. It has satisfactory reliability and validity⁴⁹. For the present study, the BRIEF was completed by the primary caregiver and the teacher separately. The correlation between parent and teacher reported GEC was .44, consistent with existing literature⁴⁶.

A T-score >63 on any of the CBCL scales, TRF scales, or BRIEF-GEC scale was used as an indicator of potential need. Achenbach⁵⁰ recommended the T-score of 63 as an appropriate cut off for classifying patients into clinical vs. non-clinical groups. This corresponds to ratings obtained by <10% of a normative sample, and is consistent with previous research regarding behavior ratings following pediatric TBI^{10,11,13}. To examine if this more liberal cut off was associated with an over identification of potential need, the cut off scores indicated in the rating scale manuals (>70 CBCL/TRF and >65 BRIEF) were also utilized. Frequencies for both the potential need and high need group are presented in the results.

Need for School Services, School Services Received, and Unmet Need—A potential need for school services was defined as: 1) IQ/Achievement need: a WASI FSIQ below 80 and/or standard scores below 80 on any of the WJ-III achievement subtests (i.e., Letter Word Identification, Calculation, and Written Expression), 2) Parent-report need: the presence of an elevation T-score ≥ 63 on the total problems subscale or one of the Diagnostic and Statistical Manual of Mental Disorders-oriented subscales (i.e., affective, anxiety, ADHD, and ODD subscales) on the CBCL and/or the presence of an elevation T-score ≥ 63 on the parent-rated BRIEF-GEC, 3) Teacher-report need: the presence of an elevation T-

score ≥ 63 on the total problems subscale or one of the Diagnostic and Statistical Manual of Mental Disorders-oriented subscales (i.e., affective, anxiety, ADHD, and ODD subscales) on the TRF and/or the presence of an elevation ≥ 63 on the teacher-rated BRIEF-GEC, or 4) Diagnostic need: a diagnosis of ADHD, developmental disability, or a learning disability as reported by the primary caregiver. Receipt of school services was defined as a participant receiving any of the following services at the long-term follow-up: 1) parent or teacher report of current IEP services, 2) parent or teacher report of 504 services currently being received at school, or 3) parent report indicating that the child was receiving any special instruction or support in school at the time of the long-term follow-up assessment. An unmet need was defined as the presence of need for services (as described above) that was not accompanied by reported receipt of school services.

Statistical Analyses

Separate chi-square analyses were used to examine injury group differences in 1) potential need for academic service, 2) academic service utilization, and 3) unmet need for academic services. To further understand the source of potential need, separate chi-square analyses were conducted to examine injury group differences in IQ/Achievement need, parent-report need, teacher-report need, and diagnostic need. Predictors of receipt of academic services were investigated using logistic regression with IQ/Academic need (>80 vs. <80), parent-report need (potential need vs. no need), teacher-report need (potential need vs. no need), and diagnostic need (previous diagnosis of ADHD/LD/DD vs. no previous diagnosis) were entered into the model as independent variables. Injury group status, SES, and age at injury were entered into the model as covariates.

Differences in the frequency of unmet need between the severe TBI, moderate TBI, and OI group were examined using a chi-square analyses. A logistic regression was used to investigate predictors of unmet need, with group, age at injury, SES, sex, and race entered into the model as independent variables.

RESULTS

Sample Description

A total of 221 children were enrolled into the study at a mean (SD) of 1.32 (.72) months post injury, 141 of whom participated in the long term follow up a mean of 6.8 (SD = 1.10) years post injury. To focus on children with more severe injuries, 11 children with uncomplicated mild TBI (GCS > 13 with no neuroimaging findings) were excluded from this study, leaving 58 children with TBI (16 severe, 42 moderate) and 72 children with OI. Table 1 lists sample characteristics at the long-term follow-up visits. Chi-squared tests and t-tests failed to reveal significant group differences at the long-term follow-up on any demographic variables. Additionally, those who completed the long-term follow-up did not differ significantly from those who did not complete the long-term follow-up in terms of injury type, sex, race, or SES.

Need for Academic Services

The frequency of potential need (using parent and teacher ratings >63), high need (using CBCL/TRF >70 ; BRIEF >65), as well as specific areas of need (IQ/Achievement need, parent-report need, teacher-report need, diagnostic need) are presented in Table 2. The proportion of individuals identified as having a potential need for academic services at the long-term follow up differed significantly between injury groups ($\chi^2=14.07$, $p<0.01$). Specifically, rate of need was significantly lower in the OI group (37.50%) compared to the moderate TBI group (64.29%; $\chi^2=7.63$, $p=0.01$) and severe TBI group (81.25%; $\chi^2=10.11$, $p<0.01$). The severe TBI group and moderate TBI groups did not differ significantly in rates of need ($\chi^2=1.56$, $p=0.21$). Interestingly, utilization of lower cut off scores for the CBCL/TRF and BRIEF resulted in the identification of only 4 additional children with moderate TBI as having a potential need (Table 2).

Additionally, total number of need areas (range 0–4) was significantly different between injury groups ($F(2,127) = 8.27$, $p < .001$; see Table 2). Children with TBI (both moderate and severe) met criteria for potential need in more areas than those with OI, and those with severe TBI met criteria for potential need in more areas than those with moderate TBI. The rate of need within each domain used to define need (IQ/achievement, parent-report, teacher-report, diagnostic) varied across injury groups (Table 2). The frequency of need within the severe TBI group was significantly greater than in the OI group for all domains of need. The severe TBI group had a greater rate of IQ/Achievement need than the moderate TBI group; however, the rate of parent-report need, teacher-report need, and diagnostic need were similar between the two groups. Finally, rates of IQ/achievement need and diagnostic need were similar between the moderate TBI and OI group, while the moderate TBI group had greater parent-reported and teacher-reported need than the OI group.

Academic Service Utilization

When academic service utilization was examined with the entire sample, the rate of utilization was significantly different across injury groups ($\chi^2=9.18$, $p=0.01$). Follow-up group comparisons revealed this difference was driven by significantly greater utilization of academic services by the severe TBI group compared to the other injury groups (see Table 2; Severe TBI – OI: $\chi^2=9.89$, $p=0.002$, Severe TBI – Moderate TBI: $\chi^2=4.63$, $p=0.03$). The moderate TBI and OI groups did not differ significantly ($\chi^2=0.71$, $p=0.40$). However, among those who met criteria for potential need for services, the rate of utilization did not differ significantly between injury groups (see Table 2). This was also the case when examining service utilization among those identified as having high need. Interestingly, some children who were receiving services did not meet the study's criteria for need.

A logistic regression was used to explore which areas of need (IQ/Achievement need, Parent-report need, Teacher-Report need, diagnostic need) predicted the receipt of academic services, after controlling for injury group, SES, and age at injury. IQ/Achievement need was the only significant predictor ($\chi^2=12.14$, $p<0.001$) of academic service utilization with an IQ/Achievement need predictive of greater service utilization.

Unmet Academic Service Utilization

When unmet need was examined within the entire sample, the rate of unmet need differed significantly across groups ($\chi^2=6.49$, $p=0.04$), with significantly higher rates of unmet need in the moderate TBI group compared to the OI group ($\chi^2=5.93$, $p=0.015$); however, rates of unmet need in the severe TBI group did not differ significantly from rates in the moderate TBI group ($\chi^2=0.04$, $p=0.84$) or OI groups ($\chi^2=2.43$, $p=0.12$; see Table 2). Rates of unmet need within the sample identified as having a potential need for academic services was high (46.2%–63.0%) and similar across groups (see Table 2). To better understand how domain and number of needs was associated with unmet need, frequencies were examined (see Table 3). Parent-reported need and teacher-reported need were the areas of need most likely to be unmet, when compared to IQ/achievement need and diagnostic need. Additionally, as the number of need areas increased (from 1–4), rates of unmet need decreased. Finally, logistic regression explored factors, injury group, age at injury, SES, sex, and race, as predictors of unmet need. None of these factors were significant predictors of unmet need (all p 's > 0.05).

DISCUSSION

The present study evaluated academic need, corresponding academic service utilization, and factors associated with receipt of academic services at a long-term follow-up visit approximately 6.8 years following TBI in early childhood. At the long-term follow-up, children with TBI (both moderate and severe) continued to have higher rates of academic need compared to the OI group, with no significant differences in academic need between the severe and moderate TBI groups. A closer look at group differences on the individual domains used to define need showed a differential effect of injury group. The severe TBI group had greater rates of need than the OI group in all domains of need. Compared to the OI group, both TBI groups had higher rates of parent and teacher reported need, and the severe TBI group also had higher rates of IQ/achievement need than both the moderate TBI and OI groups.

The severe TBI group also demonstrated significantly higher rates of service utilization than the other groups. The percentage of children with TBI experiencing an unmet academic need is concerning (46–63%). Interestingly, the moderate TBI group had significantly greater frequency of unmet need compared to the OI group, while the severe TBI group did not differ significantly from the moderate TBI group or OI group. This is consistent with studies that have reported high rates of post-injury needs going unmet among those with less severe TBI^{51–53}. In particular, this finding is consistent with Glang et al.²¹ report that less than 7% of children who sustain mild to moderate TBIs receive academic services one year post-injury, placing this group at risk of having unmet needs over time. One possible explanation for this may be that children and adolescents with less obvious sequela from their injuries may be at greatest risk of not having their academic needs met. Once physical consequences of the injury have resolved, there may be an expectation that cognitive/behavioral sequela have resolved as well; however, this may not be the case. Children and adolescents with a history of TBI should be monitored/screened with a different lens than those without an injury history. Reliance on obvious or physical sequela of injury as a proxy for overall cognitive and behavioral recovery may result in significant areas of unmet need.

Surprisingly, while IQ/achievement need predicted service utilization, parent and teacher report did not, and parent and teacher-reported need were more likely to be associated with unmet need than IQ/achievement need or diagnosis of ADHD/LD/DD. A number of potential reasons for this discrepancy can be entertained. First, behavioral issues reported by parents may not be apparent or impairing in the school setting. However, in the present sample, parent and teacher reports were moderately correlated (.29–.45), suggesting some consistency in behavior across settings. A second possibility is that services addressing behavioral concerns within the school setting were less available than services addressing cognitive or learning difficulties. Classroom teachers and other school personnel may manage behavioral concerns without formal services, lessening any observed relationship between reported behavioral concerns and service utilization. A further possibility is that parents did not view their child's behavior as sufficiently problematic to justify services within the school setting. Bussing and colleagues⁴³ discuss the reasons that parents seek out services for their child's behavior as multilayered, involving (1) the degree to which the behavior is problematic, (2) the origin of the behavior, and (3) whether or not the behavior is temporary. For example, a parent who does not view their child's behavior as a problem, who attributes the onset of behavioral difficulties to TBI, or who views these behaviors as temporary even years post injury, may be less likely to seek formal services for their child^{54–56}. Along these lines, as the number of need areas increase the rate of unmet need decreased. It is possible that parents of children who experienced impairment in multiple areas or across multiple settings were more likely to view their child's behavior as problematic, and therefore more likely to seek out services for their child within the school setting.

The current study is not without limitations. We defined service utilization based on services being provided at the time of the long-term follow-up visit, and that definition provides no information about the type or duration of academic service utilized. Additional information regarding academic service utilization was collected 18-months post injury; however, this information was not used in the present analyses as not all participants had entered into a formal school setting at that time. While the study had the advantage of using multiple informants when evaluating service utilization, gathering documentation of formal services from school systems themselves would have been preferable. Another limitation results from our measurement of academic need. While a strength of the study is the incorporation of multiple types of measurement to assess need (e.g., standardized testing, teacher report, and parent report), we may have over-identified academic need in those instances where reported problems were being well managed by the parent or teacher. Finally, rates of academic need were surprisingly high within the OI group. Initially this was thought to be an artifact of using more liberal cut-off scores for parent and teacher-ratings; however, the use of manual-recommended clinical cut-off scores for these measure did not change the number of OI patients identified as having a potential academic need. This high rate of need raises questions as to how representative this group was of the general study population. The OI group was selected to control for background factors related to risk for traumatic injury, but inclusion of a non-injured comparison group may have provided a better estimate of needs in the children's peer group.

Despite these limitations, our findings suggest that a significant proportion of students are not receiving academic services they may be in need of. While this was true for children with and without a history of early childhood TBI, the group with the greatest degree of unmet need was those who sustained a moderate TBI during the preschool years. This finding may arise because school professionals and families often feel like a child has ‘recovered’ from their injury after a number of years, especially in the context of a less severe injury. Children in the current sample were injured between the ages of 3 and 7, and many were not in a formal school setting during the acute recovery phase (~1 year post injury). While children with severe TBI may have some residual physical deficits at the long term follow-up assessment, the deficits experienced by those with moderate injuries are not likely to be readily visible. Although children with moderate TBI may have recovered substantially in a variety of domains, they may continue to experience prolonged impairment in domains required for continued academic achievement, such as executive functioning, or may have difficulty meeting the more complex demands required of them as they advance through school. The present findings underscore the importance of continued monitoring of behaviors and academic progress in students with histories of both moderate and severe TBI.

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Table 1

Demographic information for patients who completed the long-term follow-up visit.

	OI (n = 72)	Moderate (n = 42)	Severe (n = 16)
Age	11.91 (1.08)	12.00 (1.07)	12.17 (1.52)
Age at injury	5.10 (1.08)	5.19 (1.21)	5.04 (.98)
Sex (% male)	52.78%	59.52%	63.50%
Race (% White)	76.39%	76.19%	62.50%
SES	.09 (.92)	.04 (1.05)	-.42 (.68)
Teacher ratings	66.67%	66.67%	56.25%

Note: SES = Socio Economic Status and is a z-score created by a combination of maternal education and census tract income.

Table 2

Rates of need for service, service utilization and unmet need by injury group.

	OI (n = 72)	Moderate TBI (n = 42)	Severe TBI(n = 16)	X ² /F	Group Differences
Total Potential Need	27 (37.5%)	27 (64.3%)	13 (81.3%)	<i>p</i> < .01	Mod>OI; Sev>OI; Sev=Mod
Total High Need	27 (37.5%)	23 (54.8%)	13 (81.3%)	<i>p</i> = .01	Mod=OI; Sev>OI; Mod=Sev
IQ/Achievement need	10 (13.9%)	5 (11.9%)	6 (37.5%)	<i>p</i> = .04	Sev>Mod; Sev>OI; Mod=OI
Parent report need	17 (23.9%)	19 (45.2%)	11 (68.8%)	<i>p</i> < .01	Sev=Mod; Sev>OI; Mod>OI
Teacher report need	11 (22.9%)	13 (44.8%)	6 (60%)	<i>p</i> = .03	Sev=Mod; Sev>OI; Mod>OI
Dx LD/ADHD/DD	13 (18.1%)	14 (33.3%)	7 (43.8%)	<i>p</i> = .05	Sev=Mod; Sev>OI; Mod=OI
Mean number of needs	1.88 (.28)	1.21 (.17)	.71 (.13)	<i>p</i> < .01	Sev>Mod; Sev>OI; Mod>OI
Service Utilization					
Total Sample	14 (19.4%)	11 (26.2%)	9 (56.3%)	<i>p</i> = .01	Mod = OI; Sev>OI; Sev >Mod
Potential Need Sample	13 (48.2%)	10 (37.0%)	7 (53.9%)	<i>p</i> = .55	
Unmet Need					
Total Sample	14 (19.4%)	17 (40.5%)	6 (37.5%)	<i>p</i> = .04	Mod>OI; sev = OI; mod = sev
Potential need sample	14 (51.9%)	17 (63.0%)	6 (46.2%)	<i>p</i> = .55	

Note: OI = Orthopedic Injury; Mod = Moderate TBI; Sev = Severe TBI.

Table 3

Rates of unmet need by area of need and number of need areas.

Identified Need	Frequency of unmet need
Area of need	
<hr/>	
IQ/Achievement need	3 (14.3%)
Parent report need	25 (53.2%)
Teacher report need	20 (66.7%)
Dx LD/ADHD/DD	11 (32.4%)
<hr/>	
Number of need areas	
<hr/>	
0 areas of need	--
1 area of need	20 (87.0%)
2 areas of need	12 (46.2%)
3 areas of need	5 (33.3%)
4 areas of need	0 (0%)
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