

Brain Injury in Justice-Involved Youth: Findings and Implications for Juvenile Service Professionals

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ABSTRACT

It is well-established that the prevalence of brain injury among justice-involved populations is significantly greater than that of the general population. From 2014-2018, a demonstration project was conducted in two juvenile detention centers in southeastern PA. Its core strategy was to identify youth with history of brain injury; determine their neurocognitive barriers to successful re-entry; and create release plans including connections to appropriate resources. 489 youth participated. They were screened for brain injury utilizing the Ohio State University Traumatic Brain Injury Identification Method, and those who screened positive, were assessed utilizing standardized measures of memory and executive functioning. Results indicated that 49% had history of brain injury, with an average of 2.59 injuries per youth. 62% of injuries did not involve a loss of consciousness, and two-thirds never sought treatment for their injury. A history of repetitive blows to the head was also common, and often caused by violence. 147 youth were subsequently evaluated for cognitive impairment. 57% showed evidence of significant cognitive impairment, with the most common impairments being working memory, behavioral regulation, and delayed recall of novel information. Resources included referrals to brain injury school re-entry programs, vocational rehabilitation, and medical rehabilitation.

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INTRODUCTION AND PROJECT DESCRIPTION

Traumatic brain injury (TBI) is not uncommon among younger people. In fact, the Centers for Disease Control and Prevention report that children have the highest rate of emergency department visits for TBI of all age groups (Haarbauer-Krupa, Glang, Kurowski, & Breiding, 2018). Whether traumatic,

non-traumatic, or acquired by disease, brain injuries often have lifelong consequences. Brain injury affects children differently than it does adults. Injuries of any severity to a developing brain can disrupt development, limit academic potential and performance, affect participation in positive social activities, and ultimately impact the trajectory of a child's life. The kinds of cognitive and behavioral

issues associated with brain injury also increase the risk of legal involvement in both youth and adults (Williams et al., 2010a; McIsaac et al., 2016).

It is unclear how many children currently live with a disability related to brain injury as brain injury in childhood is often under-diagnosed and under-reported (Cantor et al., 2004; Glang et al., 2015). Victims of child abuse, including abusive head trauma or “shaken baby syndrome,” for example, are often under-identified (Jenny, Hymel, Ritzen, Reinert, & Hay, 1999; Reijneveld, van der Wal, Brugman, Sing, & Verloove-Vanhorick, 2004). Furthermore, there is an over-representation of TBI in at-risk populations, similar to those often found in juvenile services. Those living in poverty, people who are homeless, and incarcerated populations also report a higher prevalence of TBI (Dams-O’Connor, Pretz, Billah, Hammond, & Harrison-Felix, 2014a).

Many studies indicate that brain injury is significantly overrepresented in offender populations. Several meta-analyses of studies of lifetime history of TBI among incarcerated adults suggest prevalence rates of 46% to 60% (Farrer and Hedges, 2011; Shiroma, Ferguson, & Pickelsimer, 2012; Durand et al., 2017). Studies have repeatedly found that adolescents with a history of TBI are over-represented in juvenile justice settings. A systematic review of ten studies reported prevalence rates of brain injury among incarcerated youth from 16.5% to 72.1%, with a rate of 100% reported among a sample of young offenders who had been sentenced to death (Hughes et al., 2015). A study in the United Kingdom revealed that 65% of young male offenders reported a history of some form of TBI, with 46% reporting a loss of consciousness, and more than 70% reporting multiple injuries (Williams, Cordan, Mewse, Tonks, & Burgess, 2010). Recent studies in New York and Texas also showed significant numbers of detained youth with history of brain injury upon screening (Kaba, Diamond, Haque, MacDonald, & Venters, 2014; Gordon, Spielman,

Hahn-Ketter, & Sy, 2017) with the majority of injuries occurring prior to the adolescents’ criminal offenses. Farrer, Frost, and Hedges (2013) found juvenile offenders to be 3.38 times more likely to have had a TBI than juveniles not involved in the criminal justice system.

Brain injury among justice-involved youth is also associated with other risk factors. Vaughn and colleagues (2014) utilized data collected in a longitudinal, prospective study to compare young people who reported TBI (which caused a loss of consciousness or required medical attention) with those who did not. Those with TBI scored significantly higher on measures of psychopathy, moral disengagement, and impulsivity. They also had higher levels of delinquency, bullying, and antisocial influence via their peers and were significantly more likely to have reported that they had witnessed or been a victim of violence. Similarly, brain injury during childhood and adolescence has been found to be correlated with a subsequent decrease in impulse control among a sample of previously adjudicated males, and therefore also with risk of justice involvement (Schwartz, Connolly, & Valgardson, 2018). Other studies link TBI in adolescents with substance misuse, violent behavior, and mental health problems, including suicidality (Buckley & Chapman, 2016; Williams et al., 2018; Perron & Howard, 2008).

Brain injury is often invisible, under-reported and under-diagnosed. Yet, it can affect individuals in ways that are life-altering and can lead to justice involvement. Problems with executive functioning (attention, initiation, problem-solving, judgment, inhibition of behavior, planning /anticipation, self-monitoring, emotional regulation, motor planning, organization, mental flexibility, and working memory) often impact day-to-day functioning and productivity (Fortin, Godbout, & Braun, 2003; Dennis, Guger, Rocadin, Barnes, & Schachar, 2001).

They can also lead to problems with self-regulation, personality changes, anti-social behavior, and impaired self-awareness (Bellesi Barker, Brown, & Valmaggia, 2019; Spikman & van der Naalt, 2010; Williams et al., 2018; Max, et al., 2005). These kinds of difficulties can easily be misunderstood in school and/or by juvenile service providers and may ultimately be interpreted as willful, defiant, behavioral in nature, or the result of "criminal thinking". They also have implications for an individual's ability to meet the demands of probation, correction environments, as well as to ultimately stay out of trouble with the law. Despite all these findings, there is a lack of systematic screening for brain injury in juvenile justice settings, which enables brain injury to remain undetected and untreated (Dams-O'Connor, et al., 2014b).

In order to identify brain injury, which is often not obvious, screening is required. The Ohio State University Traumatic Brain Injury Identification (OSU-TBI-ID) instrument was designed to elicit a lifetime history of events that could have caused brain injury via a short, structured interview. It has been utilized in a number of settings including medical, mental health, substance abuse, domestic violence, and older adult programs (Corrigan & Bogner, 2007a, 2007b; Corrigan, Bogner, & Holloman, 2012; Ferguson, Pickelsimer, Corrigan, Bogner, & Wald, 2012). The OSU-TBI-ID has also been shown to be reliable in identifying individuals with a history of brain injury in corrections populations (Bogner & Corrigan, 2009) as well as to be predictive of recidivism, number of arrests, and psychiatric diagnoses in adult offenders (Ray & Richardson, 2017).

Research over the past fifteen years has pointed to the over-representation of brain injury among justice-involved populations, including juveniles. The work described here is a grant funded demonstration project undertaken by the Brain Injury Association of Pennsylvania (BIAPA) under the direction of the Pennsylvania Department of Health.

It was funded by a four-year TBI Implementation Grant made to the Pennsylvania Department of Health by the federal Administration for Community Living (ACL) between 2014 and 2018. The focus of activity over the course of the four-year initiative was on screening juvenile offenders for history of events that could have caused brain injury, assessing a sample of them for neurocognitive impairment, and connecting those with impairments to available brain injury resources. This demonstration project was conducted in two juvenile detention centers in southeastern Pennsylvania. While the goal was to identify and assist those youth with history of brain injury, the information it provided with regard to brain injury in this population is interesting and instructive. The purpose of this paper is to present that data and their implications for practice among juvenile service providers.

METHODS

The goals of this project were to provide education about brain injury and its impact on youth in the juvenile justice system, to identify youth with cognitive impairment due to brain injury, and to connect those youth with community-based resources to address their needs upon return to the community. This project was developed in response to a finding from a demonstration project conducted by the first three authors in an adult correctional institution that the majority of events that could cause brain injury occurred before the age of 21 (75%) and that 54% of those events occurred during the adolescent years from 11-20 (Nagele, Vaccaro, Schmidt & Keating, 2018).

The focus of intervention was on youth admitted to juvenile detention centers in two suburban counties in the Philadelphia, Pennsylvania area. Youth were being detained in these facilities following their apprehension for offenses, during their adjudication hearing, and while any further decisions about their release or placement were to be made. The outcome of the adjudication hearing

included the destination for youth, including returning home with supervision by juvenile probation or placement in a residential setting for a period of time for rehabilitation.

Upon receiving contact information from the detention centers on a weekly basis, the project NeuroResource Facilitator (NRF) contacted parents/guardians to explain the project and obtain consent to screen their children for brain injury. Participants were screened by the NRF for a history of events that could have resulted in brain injury using the Ohio State Traumatic Brain Injury Identification Method (OSU TBI-ID). This semi-structured interview includes questions to elicit a history of lifetime exposure to potential mechanically induced traumatic brain injury, followed by details about each event, including age at event and alteration or loss of consciousness. It also includes questions about a period of time during which multiple, repeated events that could have caused a brain injury occurred, including the age at which the events began and the most severe effect. In order to identify non-traumatic brain injuries such as infections of the brain, brain tumors, anoxia/hypoxia, seizures, the Other Central Nervous System Involvement supplement to the OSU TBI-ID was administered. Other questions included in the initial meeting with the youth covered demographics, history of behavioral disorders, and educational history.

Once a youth was identified as having a history of an event or events that could have resulted in brain injury, parents/guardians were asked to consent to neurocognitive testing and the release of test results to potential service providers and resources. Neurocognitive testing was administered by pre-doctoral neuropsychology interns under the supervision of a clinical neuropsychologist to determine whether the youth showed evidence of cognitive impairments that could be associated with these events, and which were likely to negatively

impact the youth's ability to be successful in the community upon return, including success in school, in relationships, or at work.

The neurocognitive testing battery was designed to capture performance in memory and executive function, as these are critical skills for success in meeting the demands of everyday life. The battery consisted of the following: either the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) or the Wide Range Assessment of Memory and Learning- Second Edition (WRAML-2), Wechsler Individual Achievement Test-Third Edition (WIAT-III) - Reading Comprehension and Math Problem-Solving, Behavior Rating Inventory of Executive Function-Self-Report Version (BRIEF-SR) as well as the Parent Form when possible, and the Delis-Kaplan Executive Functioning System (D-KEFS). The WRAML-2 was substituted for the RBANS to get better norms for the lower age group on memory functioning.

After testing, the project team reviewed the findings to determine if the youth would be likely to have ongoing cognitive problems as a result of their injuries as well as to ascertain the appropriate resource(s) to address the needs identified. Potential resources included the Pennsylvania BrainSTEPS School Re-entry Program; the Pennsylvania Office of Vocational Rehabilitation for Early Reach Services, Pre-employment Transition Services or for Supported Employment; brain injury specific medical assessment or rehabilitation, and other long-term services and supports. A brief report summarizing the findings and recommendations was written for each youth assessed. For youth who tested within normal limits, a letter which described the screening, the tests given, and that the youth's results were within expected ranges for his/her age and education was generated and provided to the family and probation. The NRF provided feedback to the youth and family, and facilitated connections to any resources identified, assisted with applications, made

relevant appointments and attended with the youth when needed. The NRF followed-up with these connections to ensure that the resources were in place whenever possible, in other words, a referral without follow-up is not sufficient with people who have cognitive impairments. These resources were listed in the report even if youth were going to a placement out of the area, so that probation could follow-up with these recommendations in the future.

RESULTS

Participants

489 youth in Juvenile Detention Centers were screened in this project. 79% were male, 21% were females, which reflected the gender make-up of the detention centers served. The age of youth at time of screening ranged from 12 to 20 years, with a median age of 16. Grade level ranged from 6th to 12th, with a median grade level of 10th grade. Educational placement before youth were detained included 50% public school; 25% alternate, charter, or private schools; 2% cyber schools; and less than 1% were home-schooled. 8% of the youth evaluated had already graduated from high school or obtained their GED; 4% had dropped out of school; 3% were in justice-related education settings (residential); and for 7% their school status was undeterminable.

Approximately 38% of the youth screened reported that they had a current Individual Education Plan (IEP); 34% did not; and 28% were unsure if they had or ever had an IEP. 38% of youth in juvenile detention were in special education, which is almost triple the 14% national average of students in special education (U.S. Department of Education, Office of Special Education Programs, Individuals with Disabilities Education Act (IDEA) database, 2019). For those youth with IEPs, the most common special education categories were emotional disturbance, specific learning disability or intellectual disability. There were no youth who were categorized as TBI under the IDEA classification system. In fact, many of the youth who would have been expected to be

categorized as TBI in Special Education were either not classified at all, or were placed in other categories, such as emotional or behavioral disturbed, other health impaired, or specific learning disability. Nationally, only 32% of students who would be expected to be categorized TBI based on their hospital diagnosis actually are identified TBI in Special Education (Nagele et. al 2019), but in this sample, 0% were categorized as TBI in Special Education.

Screening for History of Brain Injury

Results for those who screened positive on the OSU TBI-ID according to the OSU Interpretive Guidelines are reported here. A screen was considered positive if one or more of the following were met:

- had a moderate to severe TBI
- had a TBI with loss of consciousness before the age of 15
- had 2 or more TBIs close together
- had a mild TBI in the last weeks or a more severe TBI in the last months

Of the 237 individuals screened, 49% met one of the above criteria for a lifetime history of brain injury. For females, the percentage of individuals meeting criteria was 52%; for males the percentage was 48%.

Age at time of brain injury - The total number of lifetime brain injury events in this population was 614 events across 237 individuals, with an average number of 2.59 brain injuries per person. Ages ranged from 0-20, with a mean of 12 years and a median of 13. (*Figure 1*).

Hospitalized or treated in ER - Of the brain injury events reported, 67% of those who screened positive reported that they were not hospitalized or treated in an emergency room as a result of an injury to their head or neck. 33% of those who screened positive reported that they did go to the hospital or emergency room.

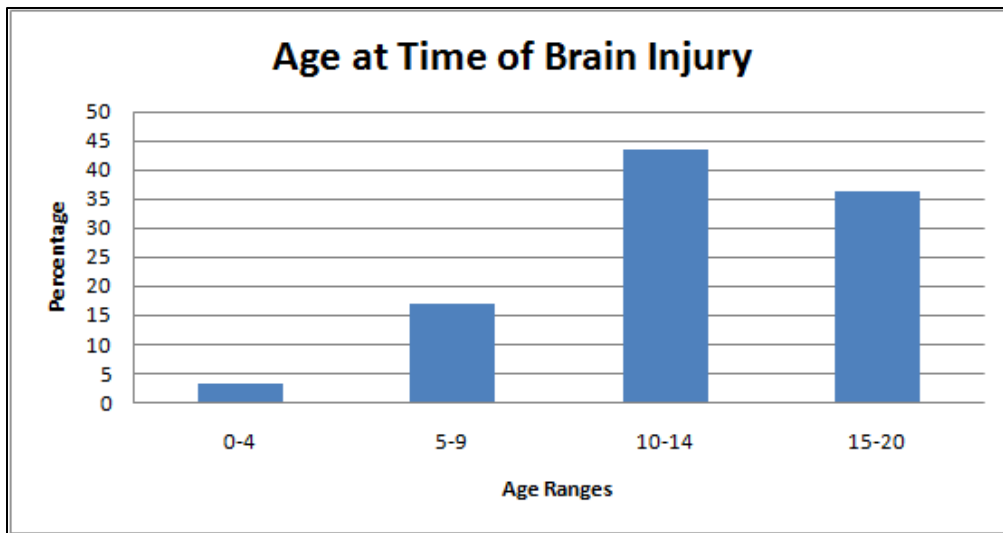


Figure 1. Age at time of brain injury

Causes of Suspected Injury

The questions asked in the OSU TBI-ID included hospitalization history as well as causes of suspected injury (Figure 2). The most common cause of brain injury in the juvenile offender population was sports (25% - either organized or informal), followed by vehicle crashes (20% - car accident or from crashing some other moving vehicle like a bicycle, motorcycle, or all-terrain vehicle (ATV)). Unlike the general population where falls account for 47% of all brain injuries, in the juvenile justice population studied, falls accounted for 20% (falling from a bike

or horse, rollerblading, falling on ice). Another 17% report being hit by or against (hit by a rock, or a playground injury), and 16% sustained their brain injury event in a fight (from being hit by someone, or being shaken violently). About 8% of those who screened positive received an injury from being exposed to an explosion or blast.

Loss of consciousness - The great majority of the events reported did not involve loss of consciousness, but rather involved an alteration in consciousness such as a dazing, which is aligned with the definition of a mild brain injury. Of those

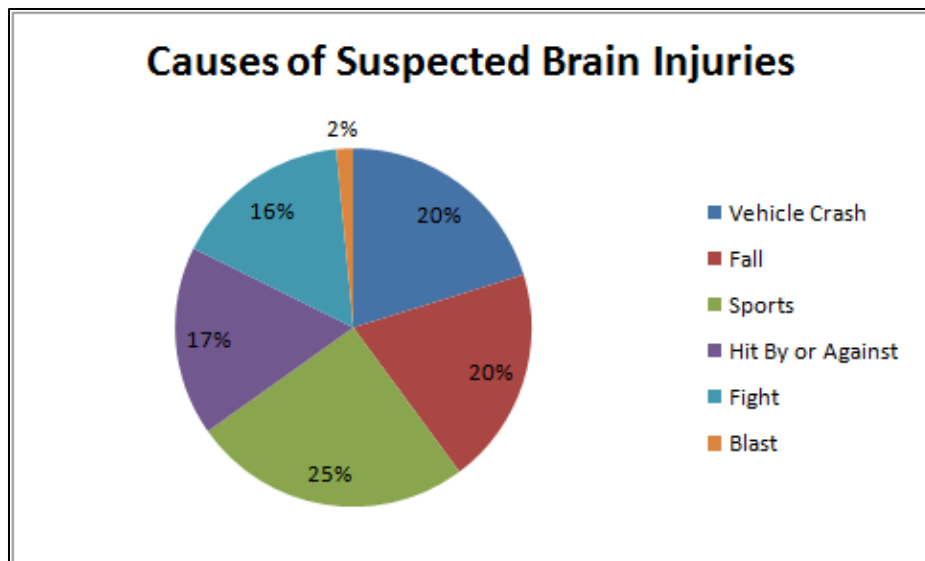


Figure 2. Causes of Suspected Brain Injuries

who screened positive for brain injury, 380 episodes or 62% involved no loss of consciousness. 183 or 30% included a loss of consciousness of less than 30 minutes. Twelve individuals (2%) reported brain injuries which would be classified as moderate to severe, with two individuals reporting losses of consciousness of more than 24 hours and ten individuals reporting losses of consciousness of between 30 minutes and 24 hours. 6% had episodes of possible brain injury but could not recall if they lost consciousness or not. (Figure 3)

than one brain injury event revealed that those events were frequently from different causes.

Repeated injuries - The OSU asks whether individuals ever had a period of time where they experienced multiple, repeated impacts to the head, such as a history of abuse, contact sports, or military duty. This question refers to repetitive injury from a particular cause, compared to sustaining multiple injuries from different causes. These injuries are not counted in the initial injury count, because they were essentially uncountable as individual episodes. 40%

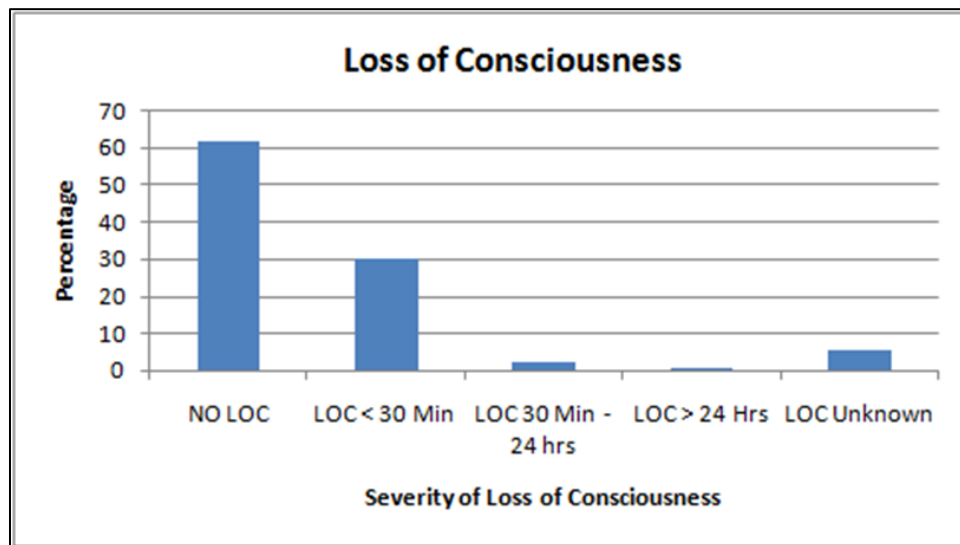


Figure 3. Severity of Loss of Consciousness

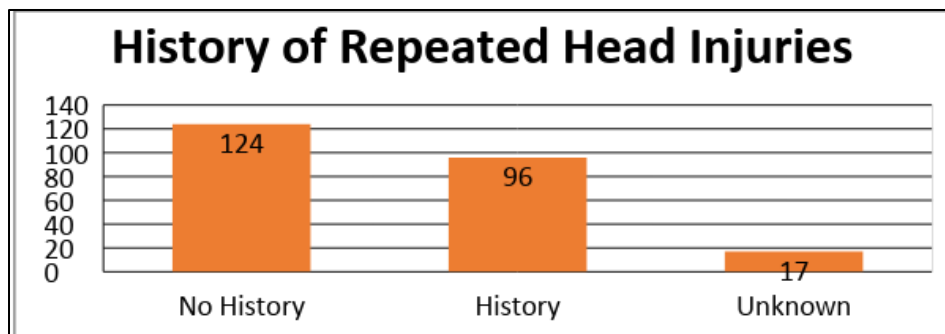


Figure 4. History of Repeated Head Injuries

Dazed/memory gap - In 88% of incidents there was a report of dazing or gap in memory; this percentage reflects incidents where there was a momentary loss of consciousness as well as incidents where there was no loss of consciousness. Further analysis of the data for people who reported more

of the youth who screened positive reported this kind of repeated injury to the head. Of those reporting repeated injuries, 56% were from sports, 24% were from abuse, 14% were from fights, 2% were from domestic violence, and 4% from other miscellaneous causes (Figures 4 and 5).

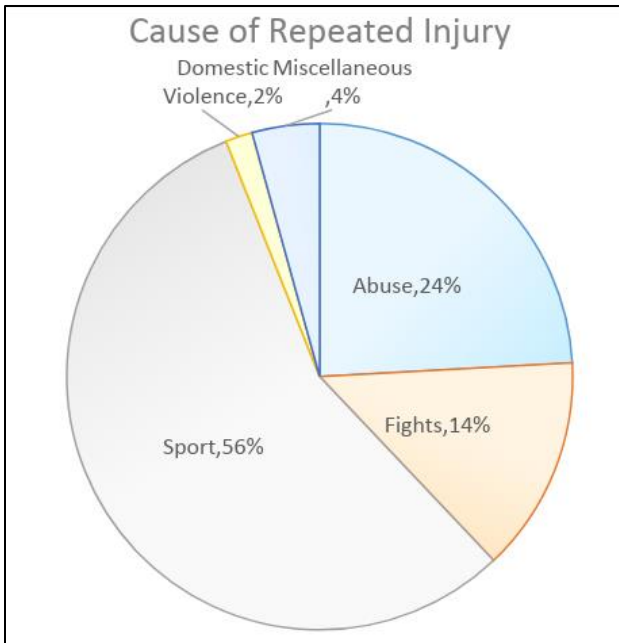


Figure 5. Cause of Repetitive Blows to the Head

Among sports injuries, the most common resulted from football at 34%, followed by boxing at 22%, skateboarding at 8%, and basketball at 5%. Figure 6 shows the percentages of repetitive injuries caused by other sports and recreational activities. The number of years over which these repetitive injuries occurred ranged from 0 to 13 years, with a median of 4 years, and a mean of 5 years. (Figure 6)

Non-traumatic causes of injury - There are non-traumatic causes of brain injury that are assessed by the “Other Central Nervous System (CNS) Compromise” supplement to the OSU. The supplement contains questions about other diseases or conditions that could result in injury to the brain. In the study sample, 14% had some cause of oxygen deprivation, or anoxia, 5% reported epileptic seizures, 3% reported known exposure to lead, 2% had received chemotherapy. Additionally, 52% of these youth had been diagnosed by a healthcare professional that they had Attention Deficit Disorder (ADD) or Attention Deficit/Hyperactivity Disorder (ADHD).

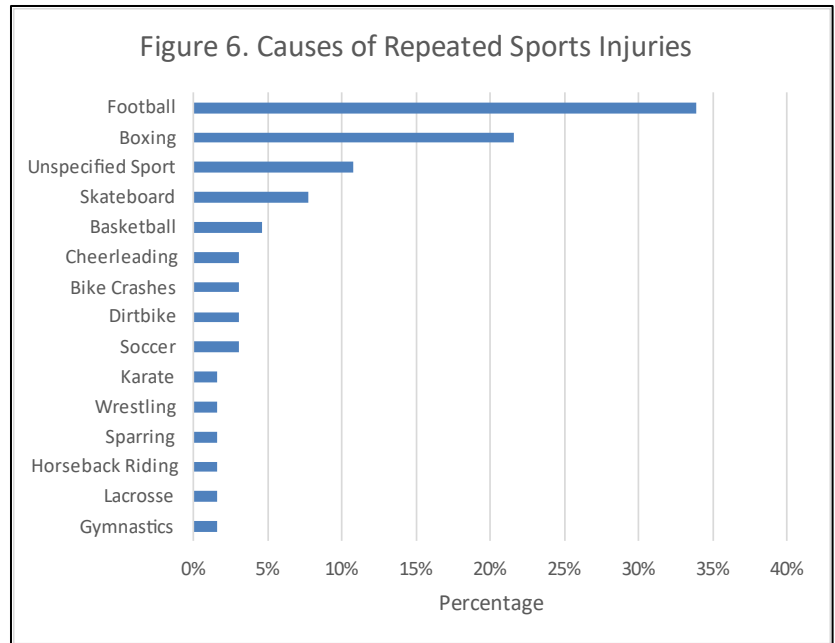


Figure 6. Repeated Sports Injuries

NeuroCognitive Assessment

147 (30%) of those youth who screened positive were assessed for cognitive impairment. There were a number of youth who could not be assessed: those whose injury was too recent; those who were released from detention and therefore not available; those who were moved to another longer-term placement before testing could occur, and those who declined to be tested.

Results of testing were determined by the supervising clinical neuropsychologist utilizing a number of clinical factors including the standardized test norms, score discrepancies within individual test results, and pre- and post-injury comparisons when possible. Any youth who had at least two scores that were in the borderline to extremely impaired ranges were considered to be impaired. Youth were also included as impaired when the pattern of their results suggested that there was a large discrepancy between tests or between their pre and post-injury level of functioning.

Of the 147 who were tested, 84 (57%) were found to be impaired. The most common types of impairments were found to be in the area of recall of

verbal information, presented in the form of a short story (Story Memory Recall with 43% showing impairment in the Borderline or Extremely Low ranges). This is an ability necessary for success in everyday life, as it relates to remembering a teacher's instructions for an assignment, or what a parent might relate to the youth regarding important upcoming events. To score in these ranges means that youth are remembering less than 22% of the novel information they are hearing from those around them.

The next most frequent impairment was Story Recognition, which was also impaired in 43% of youth. This means that not only were the youth not able to recall the details of things they were told earlier, but they were not able to recognize them from multiple choices. This would suggest that they are not even processing the information correctly in the first place. This notion was confirmed by the third most common impairment, Story Immediate Recall, which was impaired in 41% of the youth tested. This test required the youth to listen to a short story, and then immediately after, tell the story back to the examiner. Immediate Memory for Pictures was also impaired in 37% of the youth tested. For this test, youth are shown a picture of an everyday life scene, then shown another picture of the same scene where some of the details have been changed, added, or are missing. The youth must then identify what is different.

Executive functions that also showed frequent impairment included Switching Sets (36% of youth impaired), Inhibition (33% of youth impaired), and Sorting Recognition (32% of youth impaired). These are executive functions that are important for problem solving, decision making, and thinking about one's words or actions before expressing or doing them. Combined with memory impairment, deficits of these executive functions would put youth at risk for failure in schoolwork or on a job, or for being socially inappropriate.

Besides being given standardized, normed, performance-based testing, youth were also surveyed on how they perceived their functioning, especially on executive functioning. The most frequently cited impaired function on the Behavior Rating Inventory of Executive Functioning (BRIEF) was Working Memory (62% of youth reported significant impairment). Youth with this type of impairment are going to have trouble keeping more than one thought in their head at a time. This was followed by Behavioral Regulation (48% of youth reported this to be significantly impaired). This is a combination of their ability to Inhibit their behavior, to Shift sets and handle more than one piece of information coming at them at a time, and to maintain Emotional Control. Youth with these types of impairments are more likely to react to stress or pressure by acting out or blurting out the first thought that came to mind without considering the potential consequences. 38% of youth reported problems with Planning and Organization; youth with these types of problems are likely to appear very scattered and disorganized, and will likely not have a plan for their day.

DISCUSSION

Consistent with findings in the literature for youth offenders, this study found disproportionately high numbers of youth with a lifetime history of brain injury in a juvenile offender population (Hughes et al., 2015; Williams, et al., 2010a; Kaba et al., 2014). In fact, 49% of the youth screened in this project were found to have a history of events that would likely cause brain injury. This finding stands in stark contrast to research involving the general population. Data from the 2016 National Health Interview Survey found a 7% prevalence of brain injury in children aged 3-17 by parental report (Black, Zammitti, Hoffman, & Li, 2018). In fact, the finding in this demonstration project is 7 times higher than the general population. Furthermore, the vast majority of the youth screened for this project had

not been diagnosed with a brain injury, nor had they received brain injury treatment.

There could be a number of reasons why diagnosis/treatment was not obtained, and why the potential effects of these injuries may have been minimized. One obvious reason could be related to the fact that most injuries reported in screening were “mild” in nature. In fact, 62% of youth who screened positive for a lifetime history of brain injury reported no loss of consciousness. A common misperception is that one has to lose consciousness to have a brain injury, so this majority may not have recognized the need to seek diagnosis/treatment. Further, unlike many other types of traumatic injuries, children with concussion often enter the health care system through portals other than the emergency department (ED), including primary care or specialty care such as sports medicine, neurology, or urgent care. In fact, one study showed that more than 87% of initial visits related to concussion were to either primary or specialty care, and not the ED (Arbogast et al., 2016). It is also not uncommon for people who do go to the Emergency Department (ED) to have normal findings on their CT scans or other neuroimaging, leading to the mistaken conclusion that there has been no injury to the brain (Master, Balcer, & Collins, 2014). Alternatively, the ED team may be reluctant to make the diagnosis for other reasons, such as not wanting to alarm the youth or their parents or not realizing that concussions can cause long-term difficulties for some people.

Other reasons why youth may not receive diagnosis/treatment include poor parental supervision, parental characteristics, or the youth doing something improper and not reporting it because they didn’t want to get into trouble (Wand et al., 2018). Again, brain injury affects children differently than it does adults, and when unrecognized and untreated, can disrupt development, limit academic potential and performance, affect participation in positive social

activities, and ultimately impact the trajectory of a child’s life. The kinds of cognitive and behavioral issues associated with brain injury also increase the risk of legal involvement in both youth and adults (Williams et al., 2010a; McIsaac et al., 2016).

Another interesting finding involved the reporting of multiple injuries and repetitive blows to the head. This is of particular interest in light of emerging research related to the cumulative effect of brain injuries and even the effects of subconcussive blows (Bailie et al., 2019). There is currently no systematic screening for brain injury in schools, Department of Family and Youth, or in Juvenile Justice. Thus, while an individual brain injury event may seem inconsequential, when multiple brain injury events occur, the effects may be cumulative. Many youth (57%) in this project reported multiple episodes (2.59 on average).

Repeated injury is defined by the OSU as brain injury occurring during a period of time where individuals experienced multiple, repeated impacts to the head, such as a history of abuse, contact sports, or military duty. This type of brain injury represents repetitive injury from a particular cause, compared to having multiple injuries from different causes, and occurred in 40% of those who screened positive, with the major cause being sports injuries (56%). Despite the fact that every state has some form of a Concussion Law that removes athletes from play if a concussion is suspected, it appears that actions taken after removal from play are still highly variable, and do not always result in a concussion being diagnosed. Without a brain injury diagnosis, the athlete will almost certainly not receive brain injury treatment.

The other major causes of repetitive brain injury all had to do with violence (40%), including child abuse, interpersonal violence, and fighting. Juvenile offenders often come from family situations in which violence commonly occurs, and while the trauma-informed care movement has brought significant attention to the emotional trauma that

occurs in violent settings, the physical trauma to the brain is clearly not being recognized. It is important to differentiate between emotional trauma and the actual physical trauma that occurs in brain injury. While the emotional trauma certainly needs to be addressed, and may actually result in changes in neuronal activity, the addition of physical trauma to brain cells impacts how the youth is able to think, problem solve, and react in their world, and needs to be addressed in a qualitatively different manner.

This project had the ability to examine the types of residual cognitive impairments that youth with a history of brain injury continue to experience. Neurocognitive testing demonstrated impairments in areas that are crucial for success in daily life and school, including processing and recall of verbal information, working memory, behavioral regulation, and planning/organization.

Without treatment for these types of impairments, youth are at increased risk for failure in school due to problems with learning, studying, taking tests, remembering and completing assignments. Youth with such impairments might have difficulty conceptualizing how to accomplish tasks like writing a paper or completing a project, since these activities require planning, organization, and initiation. Failures might also arise in social and behavioral interactions due to problems with shifting sets, and maintaining emotional control (behavioral dysregulation), not recognizing when behavior is outside of the norm, and difficulty starting or maintaining relationships. Youth with these impairments may not grasp the nuances of social communication and may misinterpret interactions. They may recognize their lack of success in these areas of life function but may not understand the cause if they do not know they have a brain injury. This recognition without explanation can often lead to poor self-esteem and can contribute to substance misuse or depression/anxiety. These negative impacts are further complicated by the fact that even if youth undergo treatment for these issues, treatment

might not be effective because it depends on cognitive skills impaired by brain injury. Consequently, many youth become stuck in a vicious cycle of failure that begins with brain injury and is exacerbated by the situations youth must navigate.

When brain injuries are properly recognized, appropriate help is available, including cognitive rehabilitation, and/or other treatments adapted to be cognitively accessible for the youth. Additionally, these youth need a high level of structure and support to be able to meet the changing demands of transitioning to adult roles. This is not simply a matter of not trying hard enough in class, but rather represents an organic problem that changes the way the brain works and requires an understanding of those changes in order to provide appropriate services and supports.

The juvenile justice system has in the past several decades made huge strides in attempting to address youth's emotional and behavioral needs. However, without understanding and supporting brain function in youth, emotional and behavioral needs cannot be fully addressed. Cognitive behavioral therapy and motivational interviewing are now commonplace in the justice system, and these approaches can be modified to be more effective for those experiencing brain dysfunction. Additionally, providing access to new approaches such as cognitive rehabilitation, academic coaching, social communications skills training, and supported employment can also positively impact youth with brain injury. A different orientation and approach for youth with brain injury could help the juvenile justice system to become more effective with these youth.

LIMITATIONS

There were a number of inherent limitations in this demonstration project. These included a sample of convenience and potential selection bias. All participants resided in two suburban counties in southeastern PA, whose parents had consented to their participation, and who had agreed themselves

to participate. They were also individuals who had been detained and adjudicated through the court system. History of brain injury was determined by screening, which relied exclusively on self-report and usually without confirmation by medical records. The number of individuals tested was further biased in that all individuals tested had to have been detained long enough for the scheduling of testing to occur. This typically took one week to ten days and required an additional level of parental and participant request. One additional limitation of neurocognitive testing concerned the utilization of two different batteries, with the RBANS being replaced by the more appropriately normed WRAML-2 partway through the project.

CONCLUSION

The findings of this demonstration project contribute to a growing body of literature describing the over-representation of brain injury in justice-involved populations. While the data is only representative of a subset of juvenile offenders, it does shed light on a number of issues. The vast majority of brain injuries in this sample were neither diagnosed nor treated. Many were never recognized at the time of injury as potentially problematic or even reported to a parent of caregiver. Further, the type of neurocognitive challenges these youth face likely contributes to their level of risk and their responsiveness to the treatment offered through the juvenile system, including behavioral health and substance abuse treatment. The implications of these findings have been articulated by the National Partnership for Juvenile Services (NPJS) in their position statement on brain injury:

The National Partnership of Juvenile Services (NPJS) strongly advocates that juvenile justice professionals have adequate resources to meet the needs of youth with brain injury, including; staff training, validated tools for screening,

and intervention strategies to address associated behaviors, as well as access to trained education staff and/or local school districts to assist in providing appropriate educational supports. Additionally, brain injury specialists must be accessible to assess youth identified as having impairments as a result of brain injury to determine specific rehabilitation treatment needs. Local resources must be identified that can offer support, intervention, and/or treatment to address associated impairments while youth with brain injury are in custody and upon return to their community/home. Additionally, services that are designed to address recidivism as well as cognitive academic supports must be tailored for youth with impairments from brain injury. (Adopted in 2018)

FUTURE STUDIES AND RECOMMENDATIONS

The results of this project point to a need for further research on the effects of multiple brain injuries in childhood and adolescence as well as to promising practices for reducing risk of justice involvement and improving juvenile offender response to treatment, re-entry, and reducing recidivism. Specific considerations for providers and policy makers include:

- Incorporate screening for brain injury into routine health assessments in juvenile justice environments;
- Train and educate juvenile service providers about brain injury;
- Provide brain injury resource connections (NeuroResource Facilitation) to youth with history of brain injury to improve school, work, and treatment outcomes;
- Consider screening in other environments prior to justice involvement, including schools,

behavioral health and substance misuse treatment programs; child protective service agencies, etc.

Should these recommendations be incorporated into juvenile justice programs, youth coming into the system can be identified for history of brain injury and have a chance to receive appropriate neurorehabilitation treatments and supports. This opportunity may give them an alternative pathway to become successful in adult roles and responsibilities,

as well as prevent recidivism and reduce the likelihood of their ending up in the adult corrections system.

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