



Social and Emotional Support for  
Students with Persistent TBI Symptoms

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## Introduction

Mild traumatic brain injury (mTBIs), including concussions, can result in a constellation of cognitive, physical, emotional, social, and sleep-related symptoms, all of which may affect students' well-being and performance in school (Centers for Disease Control and Prevention [CDC], 2017). While most mTBI symptoms dissipate in one to two weeks, 15%-30% of children experience symptoms lasting at least three months (Babcock et al., 2013). Often, these persisting symptoms are social and emotional symptoms, which may go unrecognized and untreated (Moser, 2007). These social and emotional symptoms can adversely affect students' relationships, mental health, and academic performance. To date, school-based strategies for addressing social and emotional symptoms experienced by students who have sustained mTBIs remain poorly understood.

The **specific aims** of this project were: 1) to better understand social and emotional issues that can arise after a child or adolescent has sustained a mTBI (e.g., isolation, depression, anxiety, emotional lability), *exacerbators of symptoms*, and *alleviators of symptoms*, and 2) to develop tertiary prevention strategies using a team approach that is facilitated by school-based mental health professionals. Part of this included targeting school-based mental health professionals (e.g., school psychologists and school counselors) as key leaders within the community and providing them with educational tools to support students and their families, specifically in terms of managing social and emotional challenges related to mTBI.

**Clarification of terms.** In this report, the term *concussion* is often used in lieu of mTBI. While not all mTBIs are concussions, most of the literature described in the following sections specifically relates to concussions. Further, all participants in this project were diagnosed with concussions.

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## Executive Summary

This project involved an investigation of social and emotional symptoms following mTBI. We conducted interviews with students who sustained mTBIs and experienced significant social and emotional symptoms; we also interviewed their parents. We used this data to: 1) clarify the social and emotional issues experienced by students who sustained mTBIs, 2) identify school-based strategies for ameliorating social and emotional difficulties associated with mTBIs, and 3) develop training resources for school-based mental health professionals.

Participants included eight students with self-reported and parent-verified histories of mTBI; six of their parents also participated in interviews. Student participants included three males and five females ages 13 to 20. Participants completed a modified version of the Post-Concussion Symptom Inventory (PCSI; Schneider & Gioia, 2007) to help describe and quantify the peak severity of post-concussion emotional symptoms. Completion of the PCSI by both students and their parents allowed for a point of comparison to the interview data and to verify whether the students and parents perceived the same issues.

The semi-structured interview protocol was designed by the researchers based on a review of recent literature and their professional experiences. Participants were asked questions designed to elicit responses about their overall TBI experience, their social and emotional symptoms, what made symptoms worse, and what was most helpful during recovery. The researchers analyzed interview data through an inductive analysis process, which involved searching the transcribed interviews for meaningful fragments. The researchers reviewed these fragments and used them to develop a categorization scheme and matching codes. These codes were used to sort the data so the researchers could discover patterns and themes.

Results highlighted participants' social and emotional symptoms, what helped alleviate them, and what exacerbated them. Themes that emerged from the interviews included

anxiety/stress, depression/sadness, isolation/interpersonal difficulties, and irritability/moodiness. An exploration of variables affecting symptoms (facilitators and barriers of recovery) revealed themes related to factors at school, factors at home, medical care, and level of involvement with sports and athletic personnel. Interview results provided the basis for a proposed model of treatment.

This project resulted in three manuscripts, which have been submitted to peer-reviewed journals. One focused on the results of the student interviews (submitted to *Psychology in the Schools*), one on the parent interviews (submitted to *Journal of Amateur Sport*) and one which provides guidance and implications for school-based practitioners (submitted to *School Psychology Forum*).

Additional deliverables included a set of training PowerPoint slides <https://bit.ly/2JkEH7Z> and an animated video <https://youtu.be/BY0tsaYInbI> that were sent to all school psychology and school counseling training program coordinators in Ohio, as well as to professional listservs (e.g., Ohio School Psychologists Association). Dr. Davies and Dr. Bernstein have also submitted to present the results of the project at a national convention for the National Association of School Psychologists (NASP) in Atlanta, Georgia in February 2019.

### Information/Qualifications (Principal and Co-Investigators)

**Dr. Susan C. Davies** (Principal Investigator) has a doctorate degree in school psychology, with a specialization area of neuropsychology. As a nationally certified school psychologist, she is the founder and coordinator of the National Association of School Psychologists (NASP) Traumatic Brain Injury Interest Group. In 2015 Dr. Davies received a contract from Ohio Department of Health to develop and implement a return-to-learn concussion team model for Ohio schools. She also served as a participant in the CDC's Expert Concussion

Workgroup and as a reviewer of the American Academy of Neurology's revised sport concussion policy. She has over 15 years of experience in the field of school psychology as a practicing psychologist, program evaluator, and university faculty member. The primary focus of her research addresses traumatic brain injuries in school populations, including such issues as increasing educator awareness of TBI, efficacy of specific interventions, and developing model service plans for students with TBI. Her work has been published in such peer-reviewed publications as *Journal of Educational and Psychological Consultation*, *Contemporary School Psychology*, *Physical Disabilities and Related Services*, *School Psychology Forum*, *Psychology in the Schools*, *Journal of Applied School Psychology*, *Brain Injury*, and the edited book *Best Practices in School Psychology: System-level services*. Dr. Davies is the coauthor of the book *Working with Traumatic Brain Injury in Schools* (Routledge, 2014) and the sole author of the book *Managing Concussions in Schools* (Springer Publishing, 2016).

**Dr. Elana Bernstein** (Co-Investigator) is a clinical faculty member in the Department of Counselor Education & Human Services at UD. Her areas of professional interest and research are centered on the implementation of evidence-based mental health services for students with anxiety in school settings. She has conducted multiple empirical studies examining effective identification and treatment methods for children and adolescents with anxiety in schools.

**Dr. Corinne Daprano** (Co-Investigator) is an associate professor in sport management and the chair of the Department of Health and Sport Science at the University of Dayton. Her research interests include the study of leadership, risk management, and, organizational change in sport organizations. She is particularly interested in return to play legislation and its impact on the treatment and prevention of youth sport concussions.

## Review of Literature

Compared to adults, youth ages five to 18 are at increased risk for TBIs and prolonged recovery. In 2009, approximately 250,000 children were treated in US emergency departments for sports and recreation-related injuries that included a diagnosis of a concussion. Further, between 2001 to 2009, the rate of emergency department visits for such injuries rose 57% in this age group (Gilchrist et al., 2011). In addition to sport-related concussions, a number of school-age children sustain these types of brain injuries through falls, vehicle crashes, assault, and intentional self-harm (CDC, 2017).

The primary concussion symptom clusters described by the CDC (2017) are: 1) thinking/remembering (e.g., difficulty thinking clearly, concentrating, or remembering things), 2) physical (e.g., headache, nausea, dizziness), 3) sleep (e.g., excessive drowsiness, sleeping more or less than usual, trouble falling asleep), and 4) emotional (e.g., irritable, sad, more emotional than usual, nervous). Concussion signs and symptoms differ from person to person; thus, youth who sustain concussions may not experience all symptoms and no single treatment works equally well for all instances of concussion (Aldrich & Obrzut, 2012). Concussion symptoms do, however, provide clues related to what is going on in the injured individual's brain and can inform practitioners about potential intervention strategies.

While teachers have recently reported being fairly knowledgeable about most concussion symptoms, they are less confident in their ability to recognize emotional symptoms and behavior changes related to concussion (Dreer et al., 2017; Graff & Caperell, 2016). This symptom cluster is of particular interest because it seems social-emotional issues arise from a complex interaction between physical (damaged brain cells, neurochemical changes in the brain) and environmental (activity limitations, accumulating schoolwork) variables. Thus, this relatively unexplored symptom cluster was the focus of the present study.

Children with delayed symptom resolution have reported higher scores on anxiety and somatization scales when compared to children with early symptom resolution (Grubenhoff et al., 2016). In one study of over 400 pediatric participants, *emotional symptom scores* were higher than either neurocognitive or somatic symptoms, when evaluated more than two weeks after a concussive injury (Joyce, Labella, Carl, Lai, & Zelko, 2015). This suggests that prolonged concussion symptoms may adversely affect a student's emotional health. Adverse academic effects following a concussion, such as failure to complete schoolwork, difficulty keeping up with workload, and the presence of cognitive symptoms may be linked to the onset of anxiety and depression (Sady, Vaughan, & Gioia, 2014). Such effects can be persistent. For example, in a sample of children and adolescents who sustained mild TBIs, 11% developed an anxiety disorder and 20% developed a subclinical levels of anxiety in the six months after injury (Max et al., 2011). These anxiety problems included post-traumatic stress disorder (PTSD), separation anxiety, simple phobia, generalized anxiety disorder (GAD), adjustment disorder with anxious mood, social phobia, and panic disorder. Student athletes also reported increased depression scores up to 14 days after concussion; these coincided with neurocognitive difficulties, including impaired reaction time and visual memory (Kontos, Covassin, Elbin, & Parker, 2012). A summary of 12 studies on depression after TBI showed a prevalence rate of nearly 35% (Busch & Albern, 1998).

In addition to anxiety and depression, many students who sustain mTBIs, including concussions, often experience social withdrawal and loneliness. A survey of adolescents on the impact of loneliness on perceptions of quality of life post-TBI found significant correlations between self-reported depression and perceptions of quality of life, as well as between loneliness and anxiety (Di Battista, Godfrey, Soo, Catroppa, & Anderson, 2014).

The cause of psychosocial impairment following brain injury is likely an interaction of both physical and situational variables. While research on the neuroscience behind concussions is still in relative infancy—and largely based on animal studies or people with more severe brain injuries—it appears that a series of molecular and functional changes take place in the brain following injury (Giza & Hovda, 2001). These molecular changes hinder a person’s ability to engage physical or mental activities.

Experiencing a concussion can also create vulnerability to multiple sources of *fear*, such as fear of re-injury, fear of being perceived as weak, fear of losing one’s of team affiliation, and fear of losing scholarships (Brochek, De Marco, & Freeman, 2015). Further, students who sustained concussion often feel overwhelmed by the accumulation of missed schoolwork. These issues can be exacerbated by well-intentioned, but overly-restrictive, post-concussion rest protocols. A blanket policy banning all social activity and extracurricular involvement for prolonged periods during the concussion recovery process may exacerbate feelings of depression, anxiety, isolation, and despair in children and adolescents with concussion. While some restrictions are necessary post-concussion to facilitate recovery and minimize symptoms, students may feel frustrated by restrictions on freedoms they previously enjoyed (e.g., driving, going to movies) and isolated from peers due to restrictions on recreational, sports, and social activities. Thus, anxiety, depression, and social withdrawal may be due to a combination of new cognitive difficulties, academic stressors, and/or functional impairments that limit interaction with others.

Silverberg and Iverson’s (2013) extensive literature review suggests that lengthy physical inactivity (particularly complete rest—staying in bed and avoiding cognitive stimulation) following concussion may do more harm than good. While vigorous exercise can result in

symptoms persisting and put an individual at risk for an additional concussion, the negative consequences of complete inactivity can occur after three days. Thus, a gradual, monitored return to activity can enhance recovery.

The post-injury influence of social and emotional problems following concussion affects the ongoing development of children and adolescents and, therefore, warrants further research to help us better serve this population of students in schools. Thus, the purpose of this project was to explore the social and emotional symptoms and subsequent problems that can arise after a student has sustained a concussion. Through qualitative interviews, we explored participants' *social and emotional symptoms*, *exacerbations* of symptoms, and *alleviations* of symptoms. The project aimed to develop strategies for school-based mental health professionals to ameliorate students' social and emotional difficulties following concussion.

## Historical Perspectives

Historically, concussions were perceived as minor injuries (e.g., a “ding,” or getting one’s “bell rung”); students who sustained concussions—particularly student athletes—were encouraged to “shake it off” or “get back in the game” (Lueke, 2011). Although the majority of individuals affected by mTBIs are symptom-free within a few weeks, up to one-third experience persistent symptoms that affect daily functioning (Babcock. et. al, 2013). Further, recent evidence indicates that individuals exposed to repeated trauma to the head are at risk for chronic traumatic encephalopathy (CTE), a progressive degeneration of the brain due to repetitive head trauma. Vulnerable populations, including athletes, are often diagnosed with CTE after multiple head injuries sustained over multiple years. Symptoms of CTE include cognitive impairment, executive functioning impairment, depression, and suicidal thoughts or behavior (McKee et al., 2013). CTE can go undetected in people who have sustained multiple concussions; therefore, it is

imperative that educators and students are taught to take concussions seriously in order to prevent such lifelong difficulties (Mez, et. al., 2017).

There is evidence that educators lack adequate training in recognizing and responding to TBIs (Glang, et. al., 2010). Therefore, given the possibility of long-term effects and cumulative damage, it is imperative that school personnel develop knowledge and skills related to TBIs, including their social and emotional effects.

## Brief Review of Status of Topic in Ohio, Surrounding States, and Nationally

Nationally and in Ohio, TBI is a leading cause of death and disability (CDC, 2017). All 50 states have passed laws related to concussion and sports in school-age youth. Ohio law (R.C. 3313.539 and R.C.3707.511) currently prohibits a student suspected of sustaining a TBI from returning to athletic practice or play until cleared by a licensed healthcare professional. However, there is no law in place related to return to school protocol. The Ohio Department of Health has provided guidance to educators and families (<https://bit.ly/2L8oaVF>; *disclosure: these resources were developed by the Principal Investigator in the present project*); however, districts elect whether to adopt return-to-learn policies and whether to train school personnel on the signs, symptoms, and potential complications of TBI. This causes great variance in educators' readiness to address students' needs, particularly when they return to school still symptomatic. In particular, the social and emotional symptoms remain largely under-addressed.

## Future Trends, Regionally and Nationally

With recent media attention on concussions, there is growing recognition that educators must address students' post-concussion symptoms. The National Collegiate Athletic Association (NCAA) and the United States Department of Defense (DoD) established the Concussion

Assessment, Research, and Education (CARE) Consortium to continuously create and improve prevention and recovery research and strategies that can be applied to collegiate athletics throughout the nation (Broglia et al., 2017). In addition, the Ohio Department of Health developed the Ohio Youth Sport Concussion and Head Injury Guidelines Committee in order to maintain the Return to Play law and guidelines for schools to follow.

## Financial Issues and Considerations

In the United States, direct medical and indirect costs related to TBI total \$76.5 billion annually (Faul, Xu, & Coronado, 2010; Langlois, Rutland-Brown, & Thomas, 2004). In addition to an initial hospital visit, children who have sustained a concussion often require many visits to the doctor on their road to recovery. Children who experience persistent symptoms may need to try many different specialists and mental health professionals before finding a treatment that works for them. This undoubtedly places financial strain on parent or guardians. Children who experience persistent symptoms also often miss school and/or require special services. Thus, there is a need to improve school-based care early in the recovery process to prevent long-term difficulties and reduce costs related to treatment.

## Education and Training Issues and Considerations

This project included development of a presentation (<https://bit.ly/2JkEH7Z>) and video (<https://youtu.be/BY0tsaYInbI>) for school psychology and school counseling graduate students and practitioners on social and emotional effects of concussions. These materials were disseminated to graduate program coordinators throughout Ohio, as well as to leaders of professional organizations in Ohio (the Ohio School Psychologists Association and Ohio School Counselor Association) via email and social media sites. The investigators also submitted a

proposal to present these findings and the resulting training at the National Association of School Psychologists' annual convention.

A future goal is to incorporate such training into the standard curricula for school psychology and school counseling graduate students to ensure that the next generation of school-based mental health professionals is adequately skilled in recognizing and responding to the social-emotional needs of students with TBIs and in providing ongoing support to students and their families.

## Data and Information Issues and Considerations

**Study design.** This study utilized mixed-methods, employing descriptive statistics related to a concussion symptom scale, as well as a grounded theory qualitative research design. The complex and varying nature of challenges experienced by students who sustained concussions necessitated individual consideration of each student's path to recovery. Thus, interviews with students allowed for in-depth exploration of the social and emotional challenges experienced by seven students who sustained concussions. Participants and their parents also completed a post-concussion symptom inventory to quantify the intensity of their symptoms at their peak.

**Participants.** To be eligible to participate in this study, participants had to be school-age, previously been diagnosed with a concussion, experienced significant social and emotional symptoms as a result of the concussion, and no longer be acutely symptomatic. Participants were recruited with flyers and emails sent to professional contacts of the research team, as well as through postings on social media sites. Originally, school-age was defined as 5-18; however, early in data collection, the range was narrowed to secondary students (middle school and high school) and then expanded to include early college students who reflected on their recent high school concussions. Thus, the final pool of participants were ages 13-20, having sustained their

injuries between 11 and 19 years. Parents of the middle and high school students were also interviewed.

Eight students with self-reported and parent-verified histories of concussion participated in the study; six of their parents also participated in interviews. Student participants included three males and five females. The study was open to both athletes and non-athletes, but the final pool of participants included seven student-athletes. We actively recruited participants with pre-existing conditions, such as pre-injury disabilities, as this is a particularly vulnerable group for post-concussion difficulties; one participant had a pre-existing seizure disorder and anxiety disorder. At the time of their interviews, student participants ranged in age from 13-20. All reported experiencing post-concussion symptoms but were no longer acutely symptomatic.

Interviewees chose their interview location to ensure convenience for participants. Interview locations included a private office at the researchers' university, a private section of a coffee house, and the student's home while a parent was home. Each participant received a pseudonym for confidentiality.

**Materials.** This study used the Post-Concussion Symptom Inventory and a semi-structured interview to collect data from students and their parents.

*Post-concussion symptom inventory (PCSI).* Participants met individually with the researchers and completed consent documents prior to participating in the interview. They also completed a modified version of the Post-Concussion Symptom Inventory (PCSI; Schneider & Gioia, 2007) to help describe and quantify the peak severity of post-concussion emotional symptoms. The PCSI utilizes a 6-point rating scale of concussion symptoms (“none” to “severe”).

Factor analyses of the PCSI identified physical, cognitive, sleep, and emotional factors. The PCSI has self-report forms for youth ages 5 to 7 years (13 items), 8 to 12 years (25 items), and 13 to 18 years (26 items) as well as reports for parents and teachers (26 items). Sady, Vaughan, and Gioia (2014) reported strong internal consistency for the total scales ( $\alpha = 0.8-0.9$ ), moderate to strong test-retest reliability for self-report forms (intraclass coefficients, ICCs = 0.65-0.89), moderate concordance between parent and self-report forms ( $r=.44-.65$ ), and strong convergent validity with another concussion symptom measure ( $r=.8$ ). Interrater reliability on the child reports was evaluated as moderate to high ( $r$ 's ranging from 0.62 to 0.84; Schneider & Gioia, 2007; Vaughan et al., 2008), as was internal consistency for all three reports (Gioia et al., 2008b; Vaughan et al., 2008).

The traditional version of the PCSI asks respondents to report symptoms they experienced pre-injury and currently. For the purpose of this study, respondents were also be asked to rate their child on each item “when his/her concussion symptoms were the worst (at their “peak”). Completion of the PCSI by both students and their parents allowed for a point of comparison to the interview data and to discern whether the students and parents were reporting the same issues

***Interview questions.*** The primary instrument used in this project was a semi-structured interview, designed by researchers based on questions raised through the literature review. Participants were asked questions that were designed to elicit responses about their overall concussion experience, including: *Tell me about your concussion; Tell me about your symptoms right after the concussion; and Tell me about symptoms that lasted for more than a few weeks after your concussion.* Participants were then asked more focused questions specifically related to social, emotional, and behavioral symptoms of concussion, *Tell me about any feelings of*

*anxiety/depression/loneliness you experienced after your concussion, as well as things that hindered and helped their recovery process: What made your symptoms worse? What was most helpful following your concussion?* Participants were encouraged to tell their stories and to provide specific examples of how symptoms interfered with daily functioning, and to describe what was most helpful in improving symptoms. The interviews concluded with “*Is there anything else you want to tell me about your concussion(s) that you think will help me better understand how to help other students?*”

**Data collection.** Each investigator brought a unique perspective to the study. The primary investigator has background experiences researching with concussions in school-age children; the second author has a research focus in anxiety, and the third author conducts work and research in health and sports science. Given our experiences, we collaboratively developed broad and non-leading questions for the semi-structured interview. The interview concluded by offering participants the opportunity to share any additional information related to their experience with concussion that they wanted to share, which they may not have felt was adequately conveyed during the interview.

Trained research assistants conducted all student and parent interviews. The primary investigator (PI) trained research assistants by reviewing and discussing interview techniques and having them practice interviews on one another. Next, the research assistants audio recorded practice interviews with individuals who were not participants in the study. The PI listened to each recording and provided corrective feedback to assistants prior to data collection.

Prior to conducting the interviews, the research assistants had the student participants and their parents separately complete the PCSI. The interviews each lasted approximately 30 minutes. Interviews took place in a quiet location of the participants’ choice, most often his or

her home, with parents present in an adjacent room. In some cases, students were interviewed concurrently with their parent(s) in separate rooms, using different research assistants. In other cases, the parent interview occurred immediately before or after the student interview, using the same research assistant. During the interviews, participants described their experiences with concussions and persistent symptoms, particularly social and emotional difficulties. They also discussed factors at school that helped or hindered recovery. Follow-up questions prompted for specific examples of how symptoms interfered with daily functioning and what was most helpful in improving symptoms. At the end of each interview, the interviewer summarized key points and allowed participants to clarify or add any information. Artifacts included the interview questions, field notes taken by interviewers, and the completed post-concussion symptom inventory (PCSI). Interviews were audio recorded and later transcribed for analysis. Transcriptions were word-for-word. Extracted fragments were later edited to remove unnecessary fillers (i.e., *like, you know, um, just, I mean*) in order to improve readability of the transcripts.

**Data Analysis.** The researchers analyzed interview data through an inductive analysis process. This involved searching the transcribed interviews for meaningful fragments. The researchers reviewed these fragments and used them to develop a categorization scheme and matching codes. These codes were used to sort the data so the researchers could discover patterns and themes. Two reviewers conducted this step to eliminate potential bias and to ensure a high level of inter-rater agreement. The reviewers independently reviewed the transcripts to make sense of the data; they then communicated with each other in order to identify and arrive at consensus on overarching categorical themes. They sorted the data into appropriate categories for preliminary analysis and then identified categorical themes. If necessary, some of the themes

were re-worked and data were re-coded. In this way, they obtained an in-depth, holistic understanding of responses.

Further, the researchers analyzed the PCSI results for congruence between student and parent reports of psychosocial difficulties for each participant. These preliminary results helped the researchers identify areas that warrant further examination. In other words, if parents were not aware that their child was experiencing social-emotional difficulties, increasing parent-child communication might be a viable facet of treatment. Interview results provided the basis for a proposed model of treatment.

This study utilized *member checking* as a way of asking participants if we “got it right” (Marshall & Rossman, 2016, p. 230). Each interview concluded with the interviewer taking two to three minutes to summarize the main points of the interview and asking if the summary was accurate. Coding and analysis of the transcripts by multiple evaluators provided *intercoder reliability* and served as another means of confirming the reliability of the interview data. Further, *triangulation* of the data was conducted: in addition to interviewing the students themselves, the parents of participants were interviewed. Parent interviews also served as a means of confirming the students’ accounts of their injuries and subsequent symptoms. Finally, *peer debriefing* involved the primary investigator meeting with her research team to get reactions to the coding, case summaries, data analysis, and report drafts. The team talked through and collaboratively fine-tuned the clarity and logic of interpretations.

## Analysis of the Researcher’s Findings

Results of the PCSI indicated that both students and their parents perceived significant changes in emotional domains. While the PCSI has respondents rate a variety of symptoms, scores analyzed in this study only encompassed PCSI scores related to social and emotional

symptoms of irritability, sadness, nervousness, and feeling emotional. Each those four potential problems were rated on a 0 (Not a Problem) to 6 (Severe Problem) scale, with a total possible score of 24. All student participants reported more severe emotional symptoms from pre- to post-injury (pre-injury average=3.6, post-injury average=14), as did the parents (pre-injury average=6.8, post-injury average=18.6). When rating to the degree of difference from before the injury to after (0= “normal”/no difference, 4= “very different”/major difference), students and their parents all acknowledged some degree of change (student average=3, parent average=3.2).

**Social and Emotional Issues.** In exploring the social and emotional issues related to concussion, analysis of interview transcripts revealed four broad themes: anxiety/stress, depression/sadness, isolation/interpersonal difficulties, and irritability/moodiness. Illustrative examples appeared throughout each participants’ qualitative data transcript, a few of which are included below:

**Anxiety/Stress.** Much of the students’ anxiety and stress related to academic and social situations. For example, one participant described stress related to sensory overload: “I would get overwhelmed really easily . . . I would walk into school and just start crying ‘cause there would be so many people talking in the hallway.” Another described stress related to not being permitted to participate in athletics, “I was definitely really stressed that I couldn’t play.”

**Depression/Sadness.** A female participant compared her pre-injury to post-injury emotions: “Everything was different. Even though I had been sad in the past or lonely, it worsened.” Her stepmother shared: “She went even further, I feel like, into a depression. She would cry at night, hysterically. And sometimes at 1:00 in the morning, we would wake up. . . she had just insane, insane emotional outbursts that were very not typical.” Another described the difference from pre-injury to post-injury, as well as family variables: “Mental illness runs in my

family. So I don't know if that was because of my concussions or if it would have happened anyway. . . . But everything just made me sad. I didn't understand why but no matter what it was, it was kind of, there was always a negative side to it. That negative side just took over. . . . It really sucked because it's not an injury that people can like visibly see."

***Isolation/Interpersonal Difficulties.*** As an example of social challenges, one participant did not want to go out with friends as much, and as a result experienced changes in her relationships: "I think being stuck in a room for that long, I learned a lot of who were my actual friends . . . which was really hard cause it ended up being a lot fewer. . . . I definitely felt a lot more isolated and a lot of my friends had kind of just forgotten about me." Her mother elaborated that her daughter "was very, very social before the concussion, had a lot of friends. So she started stressing about a lot of things because she couldn't do stuff. Even if she tried to do social activities with her friends, it hurt her head and she'd have to leave."

***Irritability/Moodiness.*** Several participants disclosed that they became more irritable after their concussion. For example, one boy said "I was more irritable with my brother. . . . I get mad worse, I guess you'd say. . . . I'd yell more. I'd yell louder." His mother's interview validated this: "He'd get so angry or he'd get paranoid like 'Don't touch me! Don't touch me!' But it was all when he was in this state."

### **Variables that Affected Symptoms**

Participants discussed a number of factors that exacerbated and/or alleviated social and emotional symptoms, including factors at school, factors at home, medical care, and level of involvement with sports and athletic personnel:

***Factors at school.*** Coordinated academic adjustments helped alleviate symptoms. One student said, "I had all great teachers that were very willing to help and understanding. And that

was really helpful . . . so I got that and I got extra time if I needed to have it.” However, others were frustrated by a lack of coordination and communication. One mother said: “We’ve had some issues . . . Three, four months into school I finally decided I’d had enough and I called a meeting and I had all his teachers be able to be present and I kind of broke down what he was going through. And the teachers were like, ‘Oh well we didn’t know it was like that and we weren’t being aware of it’ and I kind of called the principal out and I was like, ‘I’ve been sending emails and calling you and I’m telling you this stuff.’”

***Factors at home.*** Several participants described their parents as key factors in their recovery. One said, “Mostly parents pushed me through it. I mean they’re definitely my number one motivators and if there are obstacles in the way they are always like pushing me. They kinda always just gave me a drive.” Another spoke positively of her parents, but also expressed some frustration at how they kept her isolated during recovery, “My mom was already saying ‘Don’t go do things with your friends, you need to focus on you.’ Which was right but at the same time . . . it was starting to wear on me to be secluded off.”

***Medical care.*** A former soccer player stated a helpful factor was communication from her neurologist to her school: “The neurologist that I was going to for sure. . . He helped me. I had to wear glasses during school, I had to drop out of my math class and I had to change my schedule so that I could go in the nurse’s office after every class. And all of those school accommodations that he helped me, he wrote letters to my deans and stuff that helped me.” At the same time, several participants struggled with side effects of medication: “I went to my doctor and she put me on medicine. . . but it was awful and it made me feel like a zombie, just every day waking up. It did not help in any way.” One parent talked at length about how her daughter struggled with her medical care providers: “Whenever we would go to the doctor she

would cry. They kept telling us that it was all in her head. That she needed therapy. And that it wasn't the concussion causing any of her behaviors, causing her headaches.”

*Level of involvement with sports and athletic personnel.* Most participants struggled initially with physical restrictions post-concussion: “When I couldn't exercise, I didn't have an outlet so I would just sit in my room and think. And I think something, thinking is my worst enemy.” Several mentioned their athletic trainers key to recovery: “I think my trainer [name redacted] actually was really, really helpful... she would talk to me and ask how I was doing. . . she's a really caring person.” Parents echoed this sentiment: “I think probably the most helpful was the trainer because she was extremely knowledgeable. She wasn't really concerned about getting [my daughter] back into play more so than she really wanted her to be healthy.” Restrictions on sports were difficult for many participants. One parent described a phone call from her son in which he “was crying, and he was like, ‘...you have nothing to be proud of me about. Like you can't talk to people and tell them I'm a state placer or I'm a football this or that.’” Yet that same boy also described some positive changes that occurred when he changed his level of involvement with sports and discovered other interests. “I've been hanging out with other people lately since I stopped wrestling, I have got into the hobby of fish and fish tanks.”

## Conclusion

The findings of this study reflect students' experiences after sustaining concussions and experiencing subsequent social and/or emotional symptoms, with the aim of developing strategies to support them at school. Commonalities and differences among participants emerged from the data. This highlights the importance of viewing each concussion case separately—not over-generalizing students' experiences—and the importance of collaborating with parents to help them understand their child's unique symptoms and needs. Common challenges included

feelings of stress, sadness, isolation, and irritability. The students could tell they felt and functioned differently than they did before their injuries. Among the most noteworthy findings were that many of the strategies commonly used to help students recover also seemed to exacerbate their social and emotional symptoms. For example, cognitive and physical rest protocols can help decrease physical symptoms, such as headaches, but they also cause students to miss school and be isolated from their peers. Further, changes in functioning exacerbated emotional problems. Memory problems and slower-than-expected recovery in particular seemed to trigger emotional symptoms.

Another issue that emerged from the data was that those who did not understand what the student was experiencing tended to make things worse, while supportive and informed parents, friends, school personnel, and athletic personnel made things better. Athletic trainers, in particular, were helpful. The fact that the students' injuries were invisible often contributed to a lack of understanding from others. Interestingly, a few participants mentioned school counselors, but did not describe them as key providers of help and support. No participants mentioned school psychologists. Thus, these two groups of professionals may be under-trained and under-utilized in supporting students' concussion recovery.

Coordination of care among professionals, parents, and the recovering student was a supportive factor. Participants described doctors sharing recommended school-based adjustments that, when followed, alleviated symptoms. Students appreciated such strategies, along with deliberate plans to minimize stressors at home and school, during recovery. Most of the participants described difficult social situations, including restrictions on activities and friendship changes. Feelings of anxiety, depression, and social withdrawal may be due to a combination of new cognitive difficulties, academic stressors, and/or functional impairments that limit

interaction with others. Those who had a way of maintaining positive social connections with old and new friends described fewer persistent social and emotional issues. It seems that social and emotional issues can be exacerbated by well-intentioned but overly-restrictive post-concussion rest protocols. A blanket policy banning all social activity and extracurricular involvement for prolonged periods during the concussion recovery process might exacerbate feelings of depression, anxiety, isolation, and despair in children and adolescents with concussion. While some restrictions are necessary post-concussion to facilitate recovery and minimize symptoms, such students feel frustrated by restrictions on freedoms they previously enjoyed (e.g., driving, going to movies) and isolated from peers due to restrictions on recreational, sports, and social activities. Given these issues that emerged from the data, we recommend the following school-based strategies.

## Recommendations

### **Gradual return to activity across settings with supports**

While cognitive exertion and vigorous exercise can result in persistent symptoms, the negative consequences of complete inactivity can occur after three days. Lengthy physical inactivity following a concussion may do more harm than good (Silverberg and Iverson, 2013). Thus, a gradual, monitored return to academic, social, and athletic activity is recommended. A few specific examples include the following:

- 1) To prevent social isolation, help students with concussions find ways to occupy their time that don't include physical or mental strain. For example, a student might join the art club for a creative outlet or become a team manager so they can stay connected to their sport while not actively practicing or playing in games.

- 2) Have a school-based mental health provider, such as a school counselor or school psychologist, directly teach students evidence-based coping strategies for stress and anxiety that might arise during the recovery, such as progressive muscle relaxation, guided imagery, deep breathing, or mindfulness.
- 3) Have a comfortable space where students can go to decompress or talk to a trusted adult, such as the school counselor, school psychologist, or nurse's office.
- 4) Help students identify and eliminate stressors, such as unnecessary schoolwork and pressure from friends to go out or from teammates to "get back into the game." For example, a teacher might not realize how stressful a backlog of assignments is for a student. Excusing less important assignments and minimizing requirements for others can help alleviate students' post-concussion anxiety.
- 5) Create plans that allow students to participate in social and milestone events, such as birthday parties and prom, without excess exertion. Such plans might include abbreviated attendance at such events; for example, attending an hour of a party, but eliminating the sleepover. While limited screen time is often recommended during concussion recovery, consider allowing use of texting and/or social media where time can be monitored (e.g., require that the device stay in the kitchen, to be used for short periods of time).

### **A trained team to provide collaborative care**

Having a trained, collaborative team facilitates coordination of care across settings. In addition to the student and parents, such a team typically includes school personnel, such as teachers, administrators, school nurses, school psychologists, and school counselors; medical professionals, such as neuropsychologists, neurologists, and pediatricians; and athletic personnel, including coaches, athletic directors, and athletic trainers.

School professionals are in a key position to help lead a team effort of implementing and monitoring such strategies to mitigate the social and emotional issues that can arise after a brain injury. Thus, we must have a workforce of educational professionals who understand brain injuries, so they can facilitate a team-based concussion response. It is also important that students themselves—particularly student-athletes—are trained to recognize and respond to concussions.

In sum, students who have sustained concussions may experience social and emotional symptoms that adversely affect their relationships, mental health, and academic performance. Such symptoms might be alleviated through a gradual return to activity, with support and coordination of care across parents, medical providers, school personnel, and athletic personnel. This project explored social and emotional symptoms of mTBI in school-age youth, from the perspective of both students and their parents. It included developing resources to train school-based mental health professionals about such symptoms and ways educators can ameliorate their effects. Equipping school psychologists and school counselors with tools and information can improve their understanding of and response to students with emotional symptoms related to mTBI.

Our understanding of the best way to respond to persistent TBI symptoms is constantly evolving. Thus, it is crucial to stay informed of new research findings and treatment options. Future expansion of this project will include further exploration of evidence-based interventions to treat social and emotional symptoms of mTBI.

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