RURAL ELEMENTARY SCHOOL STAFF'S

KNOWLEDGE OF AND EXPERIENCE WITH

PEDIATRIC CONCUSSION

A thesis presented to the faculty of the Graduate School of Western Carolina University in partial fulfillment of the requirements for the degree of Masters of Science in Communication Sciences and Disorders.

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LIST OF ABBREVIATIONS

CDC……..Centers for Disease Control and Prevention

ED……Emergency Department

IDEA……..…...Individuals with Disabilities Education Act

mTBI……...…..…Mild Traumatic Brain Injury

SLD…….…..Specific Learning Disability

TBI…….……...Traumatic Brain Injury

ABSTRACT

RURAL ELEMENTARY SCHOOL STAFF'S KNOWLEDGE OF AND EXPERIENCE WITH PEDIATRIC CONCUSSION

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The occurrence of a concussion on a young, still-developing brain can result in persistent cognitive, physical, and behavioral consequences (Torres & Shaikh, 2019). Although there has been increased attention on the prevalence of concussions in middle and high school student-athletes (Kasamatsu, Cleary, Bennett, Howard, & McLeod, 2016), there is minimal research concerning concussion management in elementary schools (O'Neill et al., 2017). Furthermore, there is little research to suggest that elementary school staff in rural areas receive proper training to manage a concussion incident or to make classroom modifications for a student recovering from a concussion (Ettel, Glang, Todis, & Davis, 2016). The purpose of this study was to assess the concussion awareness of rural elementary school staff, specifically as it relates to appropriate identification and management of pediatric concussions. In addition, the research sought to determine the prevalence with which rural elementary schools have a school-wide concussion protocol in place. Participants included elementary school staff in rural Western North Carolina. The researcher collected data via an online, anonymous survey consisting of questions related to pediatric concussion awareness, training, and school-wide policies. It was hypothesized that there would be unsatisfactory concussion awareness among school staff and an inadequate occurrence of school-wide concussion training and protocols. The results of the

survey suggested that the majority of participants did possess a basic understanding of concussion symptom identification. In addition, the data revealed that the majority of participating schools provided pediatric concussion training and have school-wide concussion response protocols in place. However, more than half of the participants indicated that they do not feel adequately trained to properly address the academic needs of a student recovering from a concussion. Thus, the training methods employed by some public school systems may be inadequate and need revision so that the transition from training to practice may be improved.

CHAPTER ONE: INTRODUCTION

Traumatic Brain Injury and Concussion

The Centers for Disease Control (CDC) referred to traumatic brain injury (TBI) as the "silent epidemic" (Faul, Wald, Wu, & Coronodo, 2010) because despite the approximately 2.5 million TBIs reported to hospitals in 2010 (CDC, 2015), countless more went unreported and undocumented. By definition, a TBI occurs when external forces cause damage to the brain, interfering with sensorimotor and cognitive functions either briefly with mild impairment or long-lasting with devastating impairment. For years, concussions were considered to be separate from TBI; however, this has changed dramatically in recent decades. Concussions are now included under the umbrella term of TBI, and the literature is growing related to its occurrence in various populations, especially children.

Concussions are a form of non-penetrating brain injury classified as mild traumatic brain injury (mTBI) and account for approximately 80% of all reported TBIs in the United States (Wortzel & Granacher, 2015). Although there is no universally accepted definition, the American Academy of Neurology (1997) defines concussion as "a trauma-induced alteration in mental status that may or may not involve a loss of consciousness" (p. 582). Concussions cause temporary or permanent impairment to brain cells that can result in emotional, behavioral, and cognitive repercussions (CDC, 2015). A multitude of factors can impact the type and severity of symptoms an individual might present with post-concussion. Certainly, the circumstances of an injury (e.g., blast injury, falls, sports injury) influence immediate and eventual outcomes, as do factors such as age and medical history (Ettel, Glang, Todis, & Davies, 2016).

Signs and Symptoms of Concussion in Adults and Pediatrics

The presentation of symptoms following a concussion can vary based on the explicit factors of the injury. These factors include the force of the impact, the location of the impact, and the presence of prior diagnoses. Common symptoms of a concussion can develop both immediately and over time. In addition, some symptoms may resolve quickly after the incident, and some may persist over weeks and months (Berstein & Davies, 2018). Prince and Bruhne (2017) explain that it is typical for symptoms that present during the acute and subacute phases of concussion recovery to fall into the categories of somatic, cognitive, and affective.

Somatic symptoms following a concussion are the most identifiable. These refer to the physical or sensory symptoms that present in the acute and subacute phases of recovery from a concussion event. Common physical symptoms reported include headaches, dizziness, and nausea. Sensory deficits can present as vision impairments, sensitivity to light, sensitivity to sound, an altered perception of taste or smell, impaired balance, decreased energy, or reduced strength (Bernstein & Davies, 2018) (Prince & Bruhns, 2017). Cognitive symptoms are often reported by people who experience a concussion as difficulties with attention, concentration, memory, processing new information, remembering instructions, difficulty multitasking, or generating answers to questions (Prince & Bruhns, 2017). Affective symptoms pertain to disruptions with mood or emotion; these can present as increased irritability, emotional lability, anxiety, or depression.

It is also common for fatigue and sleep disturbances to occur following a concussion. These can present as having trouble falling asleep, having trouble staying asleep, sleeping more than usual, or increased feelings of fatigue during normal amounts of exertion. Furthermore,

Prince and Bruhn explain (2017) that it is common for these difficulties with fatigue and sleep to exacerbate somatic, cognitive, and affective symptoms. Prince and Bruhn (2017) explain that this can begin a "cycle of symptom exacerbation" in which fatigue and somatic, cognitive, and affective symptoms aggravate one another, which can extend the duration of recovery.

Pediatric Concussion

The consequences of a concussion on a brain that is still developing have the potential to be far more detrimental than on a fully developed adult brain (Torres & Shaikh, 2019). A brain injury at any point during a childhood interrupts the trajectory of the brain's development. Pediatric concussions can cause disturbances in the acquisition of age-appropriate skills, such as the development of social skills, behavioral regulation, and impulse control (CDC, 2018). Children who endure a concussion experience an extended recovery time that can, at times, last more than four weeks, compared to the typical adult recovery period of 10 to 14 days (Gornall, 2019). According to Eisenberg et al., (2014), 77% of children reported post-concussion symptoms one week following the traumatic event, 32% at one month, and 15% at three months.

In the face of an accident or injury, children are at high risk for acquiring a brain injury due to their maturing coordination, evolving head-to-body ratio, a belief of invincibility, and frequency of participation in sports and play (CDC, 2018). Among children under 14 years of age, pediatric TBI accounted for 1,500 deaths, 18,000 hospitalizations, and 640,000 emergency department (ED) visits in the United States in 2013 (CDC, 2018). Of the children seen at a hospital following a suspected TBI, 84.5% presented with signs and symptoms consistent with a concussion (CDC, 2018). The most common causes of concussions for children under eight

years of age are falls; adolescents most often acquire concussions in sports-related injuries (Macpherson et al., 2014).

Furthermore, it should be noted that a child recovering from a head injury is at an increased risk for reinjury. According to a study completed by Curry et al. (2019), "cognitive and motor deficits associated with concussion increase the risk of a second concussion and/or other injuries during the recovery period" (p. 13). Following a retrospective cohort study, Curry et al. (2019) estimated that one in six children between the ages of five and eleven years old sustained a second concussion within two years of an initial concussion. In addition to an escalated risk of reinjury, the ramifications of reinjury also intensify. Second-impact syndrome describes the effects of a second concussion during the recovery from the first. McLendon et al. (2016) completed a systematic review of literature regarding second impact syndrome; the seven publications reviewed by McLendon et al. (2016) revealed that the patients experiencing second impact syndrome ranged in age from 13 to 23 years old. Of these patients, the only people experiencing death or permanent disability from a second concussion were younger than 20 years old (McLendon et al., 2016). The potential consequences of sustaining repeated concussions can lead to a prolonged recovery period, long-term neuropsychological deficits, and impeded development (Curry et al., 2019). It is also possible for severe conditions, such as chronic traumatic encephalopathy, to develop years later (Torres & Shaikh, 2019). Curry et al. (2019) have concluded that "a substantial proportion of youth who have concussions may be experiencing a high concussion burden, leaving them at particularly heightened risk for poorer outcomes" (p. 17).

Impacts of Pediatric Concussion Symptoms

The Center for Disease Control and Prevention's Report to Congress (2018) focuses on TBI management in children. It is a comprehensive report that lays out the developmental impacts a brain injury can have on a child, as well as the cognitive and behavioral changes that may occur. The CDC lays out the gaps in knowledge about pediatric TBI management and the impacts that improper care during recovery can have on a developing brain. The report also analyzes the need for coordinated care to be in place in order for a child to return to school and efficiently recover with minimal symptom exacerbation.

Similar to the three symptom clusters described by Prince and Bruhn (2017), the CDC's Report to Congress (2018) categorizes common pediatric concussion symptoms into four categories: 1) thinking and memory, 2)physical, 3)moods and emotions, 4)sleep. Bernstein and Davies (2018) explain that "these symptoms interact and influence the onset and occurrence of each other" (p.108). For example, a child presenting with headaches will likely have trouble concentrating in class, which can lead to a child presenting with anxiety over a change in school performance. Children who experience this cycle of symptom exacerbation are at a greater risk for decreased daily functioning and increased mental health difficulties.

It is common for children recovering from a concussion to present with executive functioning deficits. Upon returning to school, children may encounter difficulty with concentration, organization, problem-solving, and information processing. In a classroom setting, this can manifest as an impaired ability to follow multi-step directions or a decreased ability to plan for projects (Bernstein & Davies, 2018). Again, these impairments in the classroom can easily translate into increased stress and may negatively impact a child's emotions.

Changes in social and emotional characteristics are common in children following a concussion. Immediately following the concussion event, internally manifested symptoms can present as deficits with executive functioning, memory, attention, and information processing (Davies, Fox, Glang, Ettel, & Thomas, 2013). Later in the recovery process, it is common for emotional symptoms to appear, such as irritability, depression, and anxiety (Bradley-Klug, Garofano, Lynn, DeLoatche, & Lam, 2015). In addition to the internalized post-concussion symptoms, children are at-risk for behavior problems that adversely influence their environment. These externalizing behaviors can present as deficits in impulse control, conduct problems, hyperactivity, and temper regulation (Gornall et al., 2019). Both internalized and externalized behavior problems can occur primarily or secondarily as a result of the concussion. A child who has an underlying cognitive issue, such as an attention deficit, might notice an exacerbation of the deficit as a direct result of the concussion injury. However, the onset of other issues, such as anxiety, might be secondary to a child's performance limitations or increased absences that occur as a result of the concussion (Gornall et al., 2019).

Post-concussion symptoms are variable depending on the location and intensity of the impact. Children who experience concussions are at-risk for considerable impairments in social, behavioral, physical, and cognitive functioning. Immediately following the traumatic event, observable symptoms may include loss of consciousness, posttraumatic amnesia, dizziness, headache, nausea, or fatigue. In the weeks following a concussion, physical symptoms such as headache, dizziness, and fatigue may linger. In addition, children may experience impairments with concentration, diminished working memory abilities, and difficulty processing visual and auditory stimuli (Bradley-Klug et al., 2015). These deficits are directly related to potential challenges with academic achievement.

Post-concussive symptoms extend into the classroom environment in which a student recovering from a concussion may face a variety of complications that can include distractibility, slowed reading speed, and reduced ability to complete multi-step math problems. These difficulties may not be attributed as a result of a concussion or might completely go unnoticed by a teacher. According to the CDC (2018), when a student returns to school following a concussion diagnosis, school professionals should watch for increased problems paying attention or concentrating, as well as increased problems remembering or learning new information. Students may also demonstrate difficulty organizing tasks, shifting between tasks, and require more time completing tasks. The CDC (2018) also acknowledges that inappropriate or impulsive behavior during class, greater irritability, and difficulty coping with stress are common in children post-concussion, as are stronger emotions, increased fatigue, sensitivity to sensory stimulation (e.g., lights, noise), and physical symptoms (e.g., headache, nausea, dizziness).

Post-Concussion Management in the Educational Setting

Due to the dynamic nature of concussion recovery, students' needs must be frequently assessed and adjusted upon returning to school. There are widely debated theories about a child's return to school schedule (Thomas, Apps, & Hoffman, 2015); however, there is consensus regarding when and how physical and academic activities should be resumed to avoid cognitive overload and to reduce the risk of reinjury. Some children who receive a concussion diagnosis return to school with temporary or lasting impairments that might require modifications to their school environment to alleviate symptom discomfort and promote recovery (CDC, 2018).

According to the 2015 North Carolina State Board of Education policy, "Return-to-Learn After Concussion":

> Each LEA and charter school must provide information and staff development on an annual basis to all teachers and other school personnel in order to support and assist students who have sustained a concussion in accordance with their learning and behavioral needs. This annual training should include information on concussion and other brain injuries, with a particular focus on return-to-learn issues and concerns. (NCSBE, 2015)

This policy was developed in 2015 with expected implementation during the 2016-2017 school year.

When a non-sports related head injury occurs, it is common for children to return home from receiving medical intervention without a long-term recovery plan in place. The families become responsible for decisions regarding their child's return to school and activities. Often, there is a breakdown in communication between healthcare providers and educators (Kahn, Linden, Mckinlay, Gomez, & Glang, 2018). Without adequate knowledge about the cognitive, emotional, and behavioral impacts concussion has on a child, educators are at a disadvantage when tasked with providing appropriate academic support.

In a qualitative study of educators from Australia, New Zealand, Northern Ireland, and the United States, Kahn et al. (2018) investigated the teachers' knowledge of the impacts of a concussion on school performance, supporting a child recovering from concussion in the classroom, and their perception of potential challenges they may face. Kahn et al. (2018) concluded that "teachers fill their knowledge gaps about TBI with their own personal experiences and prior information about working with students with disabilities" (p. 299). They

explain that their findings support the need for international alterations to the way teachers are educated and supported (Kahn et al., 2018).

Dreer and colleagues (2016) examined the knowledge of pediatric concussions among educators by conducting a cross-sectional survey of teachers in Alabama. The purpose of their study was to determine the level of teacher knowledge of concussion symptoms, the prevalence of concussion information dissemination, and the level of knowledge of appropriate classroom management practices. Of the surveyed teachers, 22.3% perceived they were "very" or "extremely" confident in their ability to recognize concussion-related signs and symptoms. In addition, only 12.4% of educators described themselves as "very knowledgeable" about concussions (Dreer et al., 2016). The researchers reported that 41.9% of participants had received concussion information as a part of their job, and 82% of participants felt they needed more information.

In a multidisciplinary study with school psychologists, speech-language pathologists, and teachers, Ettel et al. (2016) reported that universities provided insufficient education on brain injury assessment and management across these three integral disciplines. Furthermore, an inquiry into the ten most popular special education texts used in universities revealed that an average of less than 2% of the approximately 500-page books are dedicated to traumatic brain injury, and only one of the books devoted an entire chapter to the topic (Ettel et al., 2016).

According to Davies (2016), the lack of concussion knowledge of school staff is apparent due to data reflecting the under-identification trends occurring nationwide. The article explains that the lack of school professionals' ability to identify and label concussions properly leads to children receiving services that do not assist with recovery appropriately. A qualitative, two-

phase study completed by Case and colleagues (2017) assessed educator knowledge of concussion in primary schools in New Zealand. The first phase of this study consisted of educator interviews to evaluate the knowledge and perceptions of pediatric concussions. The second phase of this study consisted of providing the educators with a brief professional development workshop focusing on concussions in children. Following the workshop, the researchers noted that over 90% of participants indicated that they would be able to use the skills acquired in the workshop to appropriately modify their teaching practice to benefit a student recovering from a concussion. In addition, Case et al. (2017) explained that a vast majority of the participating teachers expressed a need for wide-spread professional development on pediatric concussion.

The inadequacy of concussion knowledge among educators highlights the need for professional development on the topic. By educating school staff on the prevalence, causes, and identification of pediatric concussions, there is a greater chance that injuries will either be avoided altogether or recognized and addressed appropriately when they first occur (Davies, 2016). By providing tools to aid in the identification of early changes that may occur in a student who has received a head injury, immediate symptom tracking and medical intervention can take place, which can directly impact the speed of recovery (CDC, 2018).

Importance of Prevention and Appropriate Response

In most cases, temporary academic modifications are sufficient to support and aid a student recovering from a concussion. However, when a student is experiencing an extended recovery period, it might be necessary to implement more formal measures to promote academic success (CDC, 2018). When children who are experiencing a prolonged recovery from a

concussion return to school, their individualized needs can be met by implementing an individualized education plan (IEP) or a 504 plan. These measures are federally recognized, formal education plans that deliver individualized accommodations and support services (Ettel et al., 2016). A student enduring a prolonged recovery from a concussion would be eligible for a TBI identifier as a special education determination under the Individuals with Disabilities Education Improvement Act (IDEA, 2004). The Individuals with Disabilities Education Improvement Act (IDEA, 2004), defines traumatic brain injury as:

> an acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment, or both, that adversely affects a child's educational performance. Traumatic brain injury applies to open or closed head injuries resulting in impairments in one or more areas, such as cognition; language; memory; attention; reasoning; abstract thinking; judgment; problem-solving; sensory, perceptual, and motor abilities; psychosocial behavior; physical functions; information processing; and speech. Traumatic brain injury does not apply to brain injuries that are congenital or degenerative, or to brain injuries induced by birth trauma. (34 Code of Federal Regulations 300.8(c)(12))

When a formal plan is created under IDEA for a child with a TBI identifier as a special education determination, the child's right to receive appropriate, symptom-reducing accommodations and services becomes federally protected.

However, there is evidence to suggest that an overwhelming number of students with concussion diagnoses are not receiving federally recognized TBI support services. Davies (2016) reports that federal census data describes only 20% of children with a medical diagnosis of a

concussion received services under IDEA's TBI label in 2011-2012. More often, students recovering from a traumatic brain injury receive a label under other categories, such as "SLD" (specific learning disability), "other health impairment," and "emotional disturbance" (Ettel et al., 2016). The discrepancy in these statistics calls attention to the possibility that school staff may lack the awareness of concussion identification and management necessary to properly identify and respond to a student in need of individualized classroom modifications (Davies, 2016). For example, school professionals are encouraged to analyze the nature and potential triggers of symptom exacerbation. This can aid in the creation of effective interventions and modifications to the school environment that will alleviate symptom aggravation (CDC, 2018). Davies (2016) suggests other modifications, including an abbreviated school day, implementation of a break schedule, extended assignment deadlines, modified tasks, or preferential seating.

The misclassification of impairments can also lead to symptom exacerbation, prolonged recovery time, and inappropriate interventions rendered for a student with a concussion. For example, a student who is experiencing emotional lability following a brain injury may be speculated by the school as having a mood disorder, such as depression. This misinterpretation may lead the school to take steps toward addressing the mood disorder without acknowledging other physical or behavioral symptoms the student may be presenting. By misclassifying symptoms, students may be subjected to environmental stimuli that adversely impact their educational success (Davies, 2016). This, in turn, can negatively influence long-term academic outcomes.

Research Questions and Hypotheses

Significant health disparities exist between urban and rural areas (Ziller & Coburn, 2018). This stems from myriad variables, including the availability of and access to health care services, demographics, and social determinants of health (Ziller & Coburn, 2018). Graves and colleagues (2018) researched the rural-urban divide in health care availability and cost. Their findings revealed that children in rural communities showed a lower utilization rate of health care services and a significantly greater financial burden (Graves et al., 2018). Consequently, it is reasonable to extend research specifically into these rural communities to determine if previously observed research is consistent across these populations. Therefore, the purpose of this study was to shed light on the current state of concussion management in rural elementary schools. More specifically, the following research questions and hypotheses were proposed:

Question 1: Have rural elementary school employees received training pertaining to pediatric concussions?

Hypothesis0: The majority of rural elementary school staff will report having received general concussion training in the workplace.

Hypothesis1: The majority of rural elementary school staff will report not having received general concussion training in the workplace.

Question 2: Among those who have and have not received training, can elementary school employees recognize signs and symptoms of pediatric concussion?

Hypothesis0: The majority of rural elementary school staff will be able to identify symptoms consistent with concussion with 90% accuracy or higher.

Hypothesis1: The majority of rural elementary school staff will not be able to identify symptoms consistent with concussion with 90% accuracy or higher.

Question 3: Are elementary school employees aware of school-wide policies regarding pediatric concussions?

Hypothesis0: The majority of rural elementary school staff will report school-wide protocols to be followed if a concussion is suspected or possible.

Hypothesis1: The majority of rural elementary school staff will not report school-wide protocols to be followed if a concussion is suspected or possible.

Question 4: Do elementary school employees feel prepared to adequately manage cases of pediatric concussion in the classroom?

Hypothesis0: The majority of rural elementary school staff will report not wanting more training related to classroom management of a student with a known concussion.

Hypothesis1: The majority of rural elementary school staff will report wanting more training related to classroom management of a student with a known concussion.

CHAPTER TWO: METHODS

Participants

Eligible subjects for this study included teachers, administrators, and support staff in rural Western North Carolina who primarily worked with children in kindergarten through fifth grade. The subjects could be full- or part-time employees with no limitation on age or years of experience. Recruitment communications were initiated with the individuals at the highest levels of the school districts. Superintendents of Western North Carolina school districts (n = 26) were contacted via email to inquire about their willingness to allow the elementary staff in their district to participate in the research (see Appendix A). Superintendents from 11 districts responded in favor of participation in the research, three superintendents declined their districts' participation, and 12 superintendents did not respond to the inquiry. Within the 11 districts of Western North Carolina who were permitted participation, 98 elementary school principals were contacted via email by the researcher (see Appendix B). The communications between the researcher and the principals outlined instructions for distributing the recruitment material via email to their elementary school staff.

Following the completion of the research, participants were provided with pediatric concussion materials that could be applied in the school environment at the principals' discretion. The materials included a professional development PowerPoint covering general pediatric concussion information, classroom management recommendations to aid children recovering from a concussion, and suggestions for a school-wide protocol meant to be applied in the event a child is suspected of receiving a concussion during the school day. In addition, participants were provided with flyers and informative brochures created by the Centers for Disease Control and Prevention.

Survey Design

In order to assess the pediatric concussion knowledge base of rural elementary school staff, a quantitative approach in the form of a survey was determined to be the most appropriate research method (see Appendix C). Questions for this survey were generated based on discussions with elementary school staff. In addition, several survey questions were adapted from a study completed by Dreer and colleagues (2016) who conducted similar research on pediatric concussion awareness among teachers in Alabama. The anonymous survey was posted online using a web-based survey platform (Qualtrics, 2013), and the final version of the survey required less than four minutes to complete. The types of survey questions included single-answer multiple-choice, multiple-answer multiple-choice, Likert scale, and open-ended responses. The total number of questions presented to each participant was dependent upon how the participant completed the previous questions.

At the start of the survey, participants were presented with the details of the risks and benefits of participation, an assurance of anonymity, and a consent form. Indication of consent was a requirement for participants to advance to the research questions. The first five questions aimed at identifying the nature of the participants' employment. The remaining questions targeted the participants' knowledge of pediatric concussion identification, awareness of school-wide protocols, and familiarity with classroom modifications to aid students recovering from a concussion (see Appendix A). Prior to disseminating the survey, two elementary teachers and one elementary administrator were consulted to review and advise on the clarity, appropriateness, and organization of the survey questions; no changes were recommended following their review.

Procedures

The study was approved by the Western Carolina University Institutional Review Board in accordance with the protection of human subjects. Information about the research was first distributed through direct emails to district superintendents for approval. For consenting districts, direct emails were sent to principals of the elementary schools containing information about superintendent consent, the purpose of the survey, and instructions for the dissemination of the survey to the school staff. The principals forwarded the details of the study, along with the Qualtrics survey link, to the potential participants. The details of participation were outlined in the consent form at the start of the survey. Participants were required to indicate their consent before advancing to the survey questions. Due to the nature of the recruitment methods, the number of potential participants who were provided with the opportunity to complete the survey is not able to be determined.

Eligibility

Surveys that were deemed eligible to be included in the processing of the data were required to have been completed by individuals employed by a public school in Western North Carolina who work primarily with elementary students. Any surveys completed by individuals employed by a public school in Western North Carolina who do not primarily work with elementary students, participants who did not indicate consent to participate, or participants who did not answer five or more survey questions were not included in the data analysis. Out of the initiated surveys (N=263), ten surveys did not indicate consent to participate. Of the surveys that provided consent to participate (N=253), 23 were deemed ineligible due to failure to meet research criteria. Ultimately, data from 230 participants were included in the analysis. Because of the method of recruitment, the response rate for total participants could not be calculated.

Data Analysis

The data from this survey were quantified in terms of descriptive data, categorical data, frequency counts, percentages, mean, and standard deviation. All data were processed using the Qualtrics system and Microsoft Excel. Descriptive statistics were calculated using relevant questions that corresponded with each research question.

CHAPTER THREE: RESULTS

Participant Demographics

Of the current positions being held by the eligible participants, 45.7% (N=105) of the participants were classroom teachers, 13.5% (N=31) of the participants had positions categorized as "other" (e.g., school social worker, speech-language pathologist, occupational therapist, reading specialist), 10.4% (N=24) of the participants had administrative or administrative assistant positions, 9.1% (N=21) of the participants were specialist teachers (e.g., art, music, P.E.), 8.3% (N=19) of the participants were exceptional children (EC) teachers, 7.4% (N=17) were nurses/counselors, and 5.7% (N=13) of the participants were teaching assistants (see table 3.1).

The survey asked participants to provide their years of experience working in a K-12 school. The information provided revealed that 23.0% (N=53) had between 0-5 years of experience, 20.4% (N=47) had between 6-10 years of experience, 13.5% (N=32) had between 11-15 years of experience, 18.3% (N=42) had between 16-20 year of experience, 14.8% (N=34) had between 21-25 years of experience, 7.8% (N=18) had more than 26 years of experience, and 1.7% (N=4) did not answer the question (see table 3.2).

Table 3.1

Current Positions of Eligible Participants

Position	Number (N)	Percent of Total
Classroom Teacher	105	45.7%
Administration/ Admin. Assistant	24	10.4%
Specialist Teacher	21	9.1%
EC Teacher	19	8.3%

Nurse/ Counselor	17	7.4%
Teaching Assistant	13	5.7%
Other	31	13.5%

Table 3.2

Participant Years of Experience

Years	Number (N)	Percent of Total
0-5	53	23.0%
6-10	47	20.4%
11-15	32	13.5%
16-20	42	18.3%
21-25	34	14.8%
26+	18	7.8%
No Answer	4	1.7%

Pediatric Concussion Staff Training

The participants were asked to indicate their experience with receiving training pertaining to general pediatric concussion information. Of the 230 participants, 76.5% (N=176) of the participants indicated that staff training of general pediatric concussion information was provided by their school, 22.6% (N=52) of the participants denied receiving pediatric concussion training, and 0.9% (N=2) did not answer the question (see table 3.3). The participants who reported receiving general pediatric concussion training were provided with the option of explaining the training method used by the school to disseminate the information. Out of the 176 participants who were prompted to explain the training method used at their school, 43 participants reported the training as a professional development workshop, 61 participants

reported the education as self-paced online training modules, 12 participants reported the training as a discussion during a staff meeting, and eight participants reported receiving and fact sheet or brochure.

Table 3.3

Occurrences of Professional Development Related to Pediatric Concussion

	Yes	No	No Response	Total
Participants	76.5% (N=176)	22.6% (N=52)	0.9% (N=2)	100.0% (N=230)

Identifying Signs and Symptoms of Pediatric Concussion

The participants were asked to rate their confidence in recognizing concussion symptoms using a three-point Likert scale. The points on the continuum provided participants with the opportunity to label their level of confidence in recognizing concussion symptoms as "extremely confident", somewhat confident", or "not at all confident." Of the 230 participants who responded to this question, 15.2% (N=35) rated themselves as "extremely confident", 71.7% (N=165) rated themselves as "somewhat confident", and 13.0% (N=30) rated themselves as "not at all confident" (see table 3.4).

Table 3.4

Confidence in Recognizing Symptoms

	Extremely Confident	Somewhat Confident	Not At All Confident	Total
Participants	15.2% (N=35)	71.7% (N=165)	13.0% (N=30)	100.0% (N=230)

In order to measure the participants' knowledge of concussion symptoms, the survey presented a list of 17 possible concussion symptoms in a multiple choice format. For each potential symptom, all participants were provided with the opportunity to identify whether or not the symptom is associated with the onset of a concussion by selecting "Yes", "No", or "Don't Know". Of concussion symptoms that were listed in a random order, seven are considered to be commonly associated with a concussion and six are less familiar concussion symptoms. In addition, four symptoms that are not associated with the onset of concussion were dispersed throughout the true symptoms.

Of the seven common concussion symptoms that were presented, 98.7% (N=227) of the participants indicated that a headache is a concussion-related symptom, 0.9% (N=2) indicated that a headache is not a symptom of a concussion, and 0.4% (N= 1) did not know of the correlation between a headache and a concussion. When asked about nausea as a concussion symptom, 99.6% (N= 229) of the participants selected "yes", 0.0% (N=0) of the participants selected "no", and 0.4% (N= 1) did not know of the correlation between nausea and a concussion. When asked about vomiting as a concussion symptom, 99.6% (N= 229) of the participants selected "yes", 0.0% (N=0) of the participants selected "no", and 0.4% (N= 1) did not know of the correlation between vomiting and a concussion. When the participants were presented with the opportunity to identify confusion and memory problems as symptoms of a concussion, 100.0% (N=230) of the participants correctly indicated "yes". When the participants were asked whether dizziness was a concussion-related symptom, 99.1% (N=228) of the participants selected "yes", 0.0% (N=0) of the participants selected "no", 0.4% (N= 1) of the participants selected "don't know", and 0.4% (N= 1) of the participants did not answer the question. The participants were asked to indicate if a person who is suspected of experiencing a

concussion might have trouble staying awake, 98.7% (N= 227) of the participants selected “yes”, 0.4% (N= 1) of the participants selected “no”, and 0.9% (N=2) of the participants selected “don’t know” (see table 3.5).

Table 3.5

Knowledge of Common Concussion Symptoms

Symptom	Yes	No	Don’t Know	No Response
Headache	98.7% (N= 227)	0.9% (N=2)	0.4% (N= 1)	0.0% (N=0)
Nausea	99.6% (N= 229)	0.0% (N=0)	0.4% (N= 1)	0.0% (N=0)
Vomiting	99.6% (N= 229)	0.0% (N=0)	0.4% (N= 1)	0.0% (N=0)
Confusion	100.0% (N= 230)	0.0% (N=0)	0.0% (N=0)	0.0% (N=0)
Memory Problems	100.0% (N= 230)	0.0% (N=0)	0.0% (N=0)	0.0% (N=0)
Dizziness	99.1% (N=228)	0.0% (N=0)	0.4% (N= 1)	0.4% (N= 1)
Trouble Staying Awake	98.7% (N= 227)	0.4% (N= 1)	0.9% (N=2)	0.0% (N=0)

When the participants were asked to identify the less familiar concussion symptoms, 83.5% (N= 192) of the participants indicated that personality changes may occur following a concussion, 6.5% (N= 15) indicated that personality changes do not occur as a symptom of a concussion, and 10.0% (N= 23) did not know of a correlation between personality changes and a concussion. When asked about mood changes as a concussion symptom, 93.9% (N= 216) of the participants selected “yes”, 2.6% (N= 6) of the participants selected “no”, and 3.5% (N= 8) did not know of the correlation between mood changes and a concussion. When asked about whether a person with a concussion may experience sensitivity to light, 95.7% (N= 220) of the participants selected “yes”, 0.9% (N=2) of the participants selected “no”, 3.0% (N=7) did not

know of the correlation between a concussion and sensitivity to light, and 0.4% (N= 1) of the participants did not answer the question. When the participants were presented with the opportunity to identify balance problems as symptoms of a concussion, 98.7% (N= 227) of the participants selected “yes”, 0.0% (N=0) of the participants selected “no”, and 1.3% (N=3) of the participants selected “don’t know”. When the participants were asked whether comprehension delays may occur as a concussion-related symptom, 97.4% (N=224) of the participants selected “yes”, 0.4% (N= 1) of the participants selected “no”, and 2.2% (N=5) of the participants selected “don’t know”. When the participants were asked to indicate if a person who is suspected of experiencing a concussion might have trouble falling or staying asleep, 71.7% (N=165) of the participants selected “yes”, 13.5% (N=31) of the participants selected “no”, and 14.8% (N=34) of the participants selected “don’t know” (see table 3.6).

Table 3.6

Knowledge of Uncommon Concussion Symptoms

Symptom	Yes	No	Don’t Know	No Response
Personality Changes	83.5% (N= 192)	6.5% (N= 15)	10.0% (N= 23)	0.0% (N=0)
Mood Changes	93.9% (N= 216)	2.6% (N= 6)	3.5% (N= 8)	0.0% (N=0)
Sensitivity to Light	95.7% (N= 220)	0.9% (N=2)	3.0% (N=7)	0.4% (N= 1)
Balance Problems	98.7% (N= 227)	0.0% (N=0)	1.3% (N=3)	0.0% (N=0)
Comprehension Delays	97.4% (N=224)	0.4% (N= 1)	2.2% (N=5)	0.0% (N=0)
Trouble Sleeping	71.7% (N=165)	13.5% (N=31)	14.8% (N=34)	0.0% (N=0)

The symptom identification questions included four symptoms that are not directly related to a concussion. These symptoms may occur alongside other concussion symptoms; however, no research was found to suggest a correlation to concussions. Although color blindness may occur as a result of moderate or severe traumatic brain injuries, no research was identified to link acquired color blindness with mTBI. When the participants were presented with a runny nose as a symptom of a concussion, 9.1% (N=21) of the participants selected "yes," 45.7% (N= 105) of the participants selected "no, 43.5% (N= 100) of the participants selected "don't know," and 1.7% (N=4) did not answer the question. When asked whether color blindness may occur as a result of a concussion, 27.8% (N= 64) of the participants selected "yes," 29.6% (N= 68) of the participants selected "no," 40.4% (N= 93) of the participants selected "don't know," and 2.2% (N= 5) did not answer the question. When the participants were asked to identify whether a person might experience a change in allergic reactions, 5.2% (N=12) of the participants said "yes," 52.2% (N=120) of the participants selected "no," and 42.6% (N=98) of the participants did not know if there was a correlation between a concussion and changes in allergic reactions. When the participants were asked to indicate if the onset of an ear infection was a symptom of a concussion, 7.4% (N= 17) of the participants selected "yes," 51.7% (N= 119) of the participants selected "no," 39.1% (N= 90) of the participants selected "don't know," and 1.7% (N=4) did not answer the question (see table 3.7).

Table 3.7

Knowledge of Symptoms Unrelated to Concussion

Symptom	Yes	No	Don't Know	No Response
Runny Nose	9.1% (N=21)	45.7% (N= 105)	43.5% (N= 100)	1.7% (N=4)
Color Blindness	27.8% (N= 64)	29.6% (N= 68)	40.4% (N= 93)	2.2% (N= 5)
Changes in Allergic Reactions	5.2% (N=12)	52.2% (N=120)	42.6% (N=98)	0.0% (N=0)
Ear Infection	7.4% (N= 17)	51.7% (N= 119)	39.1% (N= 90)	1.7% (N=4)

The data were analyzed to determine the overall accuracy of the participants in identifying symptoms related to concussion. The surveys were evaluated to determine the percentage of correctly identified symptoms out of the total (N=17). Out of the 230 participants, 5.2% (N=12) of the participants correctly identified less than 75% of the symptoms, 10.9% (N=25) of the participants correctly identified 76%-80% of the symptoms, 37.8% (N=87) of the participants correctly identified 81%-85% of the symptoms, and 46% (N=106) of the participants correctly identified 86%-90% of the symptoms. No participants demonstrated an ability to correctly identify more than 90% of the symptoms (see table 3.8). The mean percentage of correctly identified symptoms was calculated at 83.51% with a standard deviation of 5.04 and a standard error of the mean of 1.96 (see table 3.9).

Table 3.8

Overall Accuracy of Symptom Identification

Percent Correctly Identified Symptoms	Number of Participant (N)	Percent of Total Participants
<75%	12	5.2%
76%-80%	25	10.9%
81%-85%	87	37.8%
86%-90%	106	46.1%
90%-100%	0	0.0%

Table 3.9

Mean and Standard Deviation of Symptom Identification Accuracy

	N	Mean (%)	Std Deviation	Std Error
Participants	230	83.51	5.04	1.96

School-Wide Policies Regarding Pediatric Concussion

The participants were asked to report whether school staff is required to inform a classroom teacher in the event one of their students is suspected of experiencing a concussion. Out of the 230 participants, 80.0% (N=184) stated that staff at their school is required to inform a possible concussion to the student's classroom teacher, 2.2% (N=5) of the participants denied any such requirements at their schools, and 17.4% (N=41) of the participants did not know if reporting a student's concussion to the classroom teacher was a requirement (see table 3.10).

Table 3.10

Staff Requirements Pertaining to Reporting of Possible Concussion to Classroom Teacher

	Yes	No	Don't Know	Total
Participants	80.0% (N=184)	2.2% (N=5)	17.4% (N=41)	100.0% (N=230)

The participants were asked if their school had a concussion protocol in place in the event a student was suspected of receiving a concussion during the school day. The responses revealed that 74.8% (N=172) of the participants currently work in an elementary school in which a protocol is in place, 0.9% (N=2) of the participants report working in an elementary school that does not have a protocol in place, 23.5% (N=54) of the participants do not know if their school has a protocol in place, and 0.9% (N=2) of the participants did not answer the question (see table 3.11).

Table 3.11

Occurrences of School-Wide Concussion Protocols

	Yes	No	Don't Know	No Response	Total
Participants	74.8% (N=172)	0.9% (N=2)	23.5% (N=54)	0.9% (N=2)	100.0% (N=230)

The 174 participants who reported there was currently a school-wide concussion response protocol in place were asked whether there had been staff training pertaining to the protocol. The responses indicated that 83.9% (N=146) of the participants had received concussion protocol training, 15.5% (N=27) of the participants did not receive concussion protocol training, and 0.6% (N=1) did not answer the question (see table 3.12).

Table 3.12

Occurrences of School-Wide Concussion Protocol Staff Training

	Yes	No	No Response	Total
Participants	83.9% (N=146)	15.5% (N=27)	0.6% (N=1)	100.0% (N=174)

The participants who reported a school-wide concussion response protocol were asked how frequently the staff receives training on the procedure that is in place. Of the 174 participants, 73.0% (N=127) of the participants reported receiving the training annually, 7.5% (N=13) of the participants reported receiving training on the concussion protocol one time and then never receiving training again, 2.3% (N=4) of the participants indicated that their training was in the setting of mandatory requirements for coaches and did not involve the general school staff, and 17.2% (N=30) of the participants did not answer the question (see table 3.13)

Table 3.13

Frequency of School-Wide Concussion Protocol Staff Training

	Annually	Once	Other	No Response	Total
Participants	73.0% (N=127)	7.5% (N=13)	2.3% (N=4)	17.2% (N=30)	N=174

"Other" answers referred to mandatory training for coaches

Classroom Management of Concussion Symptoms

The survey asked participants to indicate if they had any experience teaching a student who was recovering from a documented concussion. Of the 230 eligible surveys, 35.2% (N=81)

of the participants responded that they had experience teaching a student recovering from a concussion, 54.4% (N=125) of the participants responded that they did not have experience teaching a student who was recovering from a concussion, and 10.4% (N=24) indicated that the question did not apply to them given their current job responsibilities (see table 3.14).

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Table 3.14

Experience Teaching a Student Recovering from a Documented Concussion

	Yes	No	Not Applicable	Total
Participants	35.2% (N=81)	54.4% (N=125)	10.4% (N=24)	100.0% (N=230)

The participants were asked to rate their confidence in properly managing concussion symptoms in the classroom when teaching a student who is recovering from an injury. A three-point Likert scale provided participants with the opportunity to label their level of confidence in managing concussion symptoms in the classroom as “extremely confident,” somewhat confident,” or “not at all confident.” A fourth option, “not applicable given my job responsibilities,” was provided for the participants who do not hold a position in which the question would be relevant. Of the 230 participants who responded to this question, 9.6% (N=22) rated themselves as “extremely confident,” 67.8% (N=156) rated themselves as “somewhat confident,” 17.4% (N=40) rated themselves as “not at all confident,” and 5.2% (N=12) indicated that the question did not apply to them given their current job responsibilities (see table 3.15).

Table 3.15

Confidence in Managing Concussion Symptoms in the Classroom

	Extremely Confident	Somewhat Confident	Not At All Confident	Not Applicable	Total
Participants	9.6% (N=22)	67.8% (N=156)	17.4% (N=40)	5.2% (N=12)	100.0% (N=230)

The participants were asked to specify their level of satisfaction with their abilities to meet the needs of a student recovering from a concussion by indicating either that they would like more training or that they do not need more training. Out of the 230 participants, 1.3% (N=3) of the participants did not answer the question, 40.4% (N=93) of the participants selected the answer that indicated they do not believe they need more training, and 58.3% (N=134) of the participants selected the answer indicating that they would like to receive more training to adequately meet the needs of a student recovering from a concussion (see table 3.16).

Table 3.16

Satisfaction with Ability to Meet the Needs of a Student with a Confirmed Concussion

	Do Not Need More Training	Need More Training	No Response	Total
Participants	40.4% (N=93)	58.3% (N=134)	1.3% (N=3)	100.0% (N=230)

CHAPTER FOUR: DISCUSSION

The purpose of this study was to gain insight into rural elementary school staff's knowledge of pediatric concussions, specifically as it relates to appropriate identification and management of symptoms. In addition, the research aimed at determining the frequency with which elementary schools in these rural communities have a school-wide concussion protocol in place. After the data analysis of the 230 eligible surveys, the prevalence and sufficiency of rural elementary school staff training and protocols regarding pediatric concussions were determined.

Pediatric Concussion Staff Training

The North Carolina State Board of Education (2015) "Return to Learn" policy requires every North Carolina school to provide annual staff development related to concussion and return-to-learn. The present findings from the survey revealed that 76.5% of participating rural elementary teachers in Western North Carolina indicated a pediatric concussion training had been provided to them as a part of their job. This appears to be remarkably more than was reported by Dreer and colleagues (2016) reported that 41.9% of participants had received concussion information as a part of their job. Even more staggering is the comparison with an international study conducted by Kahn et al. (2018), which reported that 17.4% of their participants described receiving school training relating to pediatric concussions. The present data are encouraging that training rates have perhaps increased in recent years, even in the rural region examined here.

However, given the legislation that is in place requiring annual professional development in all North Carolina schools and the data collected in this research, it appears that some schools are not within policy compliance. It remains to be seen if this is indeed the case, as some

participants may not have attended or recall attending the training; may not consider the training adequate thus describing it as absent, or may not have fully grasped the relevance of training completed as it related to the research questions. Certainly, when policies are put in place, there must be follow-up and accountability to ensure all parties are within compliance. It is also unclear the breadth of the training provided. For example, does the training include the concussion information alone or are the classroom management strategies incorporated and for which staff persons? Many questions remain. Interestingly, the participants indicated that more training was not desired, despite the information gathered related to training occurrence and confidence. This presents another line of questions that should be explored.

Identifying Signs and Symptoms of Pediatric Concussion

The present data suggest that rural elementary school employees had an outstanding understanding of the symptoms consistent with pediatric concussions, and could, in many cases, identify uncommon symptoms. However, when participants were asked to rate their confidence in their ability to recognize concussion symptoms in an actual student, only 15.2% of the participants described themselves as extremely confident. This suggests that there is a gap in which the training does not correlate to teacher confidence, which is where it could be argued that confidence is needed most. The abilities of elementary staff to indicate concussion symptoms from a list does not correlate with their confidence in their ability to put it into practice. Therefore, future training efforts need to focus on closing this gap between knowledge of concussion symptoms and real-life implementation. This may involve different designing better training programs, incorporating case-studies, and in-school concussion drills. The feasibility of such remains to be seen, however, and future studies are warranted on this topic.

School-Wide Policies Regarding Pediatric Concussion

In addition to educators recognizing a concussion when it happens, it is important for there to be a school-wide protocol in place for educators to follow in the wake of a suspected concussion. Children who obtain a head injury and do not receive immediate, trained intervention are likely to experience sudden recurrences of symptoms and a prolonged recovery. According to Davies (2016), a school-wide protocol "ensures a consistent response, documentation of progress, clear communication between home and school, and general support for students with concussions" (p. 574). According to the policy implemented by the North Carolina State Board of Education (NCSBE, 2015), during the 2016-2017 school year, every school should have guidelines in place in response to a suspected concussion.

The participants of this study were asked to report if their school had a concussion protocol in place in the event a student was suspected of receiving a head injury during the school day. The responses revealed that about three-quarters of the participants indicated that their school currently had a protocol in place. This does not imply that a protocol is not in place in every school. It does imply that not all staff are aware of a protocol in existence, and thus, are unprepared to respond if called to do so. Our data also do not reveal the level of understanding staff has of the protocol. This relates to variables such as mandatory reporting of incidents, persons responsible for the immediate emergency response to the injury, and persons responsible for notifying first responders or parents. These are just a few examples of questions that every staff person should be able to answer. For a concussion protocol to work, all school staff must be aware of the protocol and know exactly their roles and responsibilities.

Classroom Management of Concussion Symptoms

However, when the participants were asked to rate their confidence in their ability to adequately meet the classroom needs of a student recovering from a concussion, only about 10% of the participants indicated that they were extremely confident in meeting students' needs. This data identifies another gap between teacher training and real-life implementation. This calls into question the sufficiency of the professional development provided by the schools. Is it enough that the training address identification of concussion alone? Or should training extend beyond identification to preparing staff for a real-life return-to-learn scenario? Considering the potential for additional harm to a child if the return-to-learn process is mismanaged, this seems to be a logical and critical next step in staff training.

Certainly, this next step in training has received attention over the years, and guidelines have already been suggested. For example, for a child to receive maximum appropriate support during recovery, lines of communication must be open between all of the professionals who have a responsibility for the improvement of the child's well-being. Davies (2016) suggests a multidisciplinary team to assist with concussion identification and management in the school setting. The CDC's Report to Congress (CDC, 2018) also recommends a collaborative team approach. Those involved in the team approach can include the student, parents/guardians, other caregivers (e.g., babysitters), health care professionals involved in the student's medical care, school nurse, teachers, coaches, school counselor/psychologist, speech-language pathologist, and a school administrator. The integration of all of these perspectives will allow for a well-thought-out student-centered plan.

Limitations

Several limitations were uncovered during the research process. First, a larger sample size is needed to increase the likelihood that the data and statistical findings can be generalized to the larger population. Recruiting more and from other rural counties in other parts of the United States is suggested. Another limitation was identified during data analysis. Due to the anonymous and optional nature of the survey, not all participants completed all of the survey questions. This presented as an unexpected challenge during data analysis and resulted in the researchers setting a limit to the amount of incomplete data a survey could contain to remain eligible. Surveys, by nature, have limitations that cannot be avoided. Surveys can only collect data at a single point in time. This resulted in the inability to measure whether professional development relating to pediatric concussions occurred after the survey window had closed. Another limitation to surveys is the reliance on self-reported data. Due to the anonymous nature of this study, the self-reported data could not be verified and was subject to potential participant bias.

Future Directions

During the compilation of this research, three themes emerged as areas for improvement and future research. The first is the sufficiency of the concussion training being provided to staff in rural elementary schools. Although it was reported that 76.5% of participants received pediatric concussion training, there needs to be more research focusing on the adequacy of the training and the prevalence of information retention by staff. The training is there, but it is ineffective and outdated. It would be beneficial for research to target effective methods of training to assist elementary staff with generalizing the information into real-life events in which

a concussion is suspected. It is possible that updated and hands-on training experiences (e.g., role-play scenarios, case studies) may assist staff with retention of the information. Another area that would benefit from enhancement is the prevalence of and sufficiency of training on concussion response protocols. The data indicated that 23.5% of rural elementary school staff in Western North Carolina did not know if their school had policies or protocols in place in the event a student is suspected of receiving a concussion during the school day. There is room for improvement in both the prevalence of the protocols and the staff training of the protocols. The third area that was revealed as an area of weakness for elementary schools in Western North Carolina was knowledge of beneficial ways to aid a student recovering from a concussion academically. The concussion recovery period can persist if environmental factors are exacerbating symptoms. Based on research by Davies (2016), a team-based approach to helping students manage the period of concussion recovery would open lines of communication between school and medical professionals. In addition, a team-based approach would help identify the unique needs of individual students. School staff should be trained in identifying when a student experiences the recurrence of a concussion symptom. Schools should be equipped with the knowledge and tools to make environmental modifications for a student in order to reduce symptom exacerbation.

Conclusion

The results of this research suggested that the majority of the rural elementary school staff did possess a basic understanding of concussion symptom identification. In addition, the data revealed that the majority of participating schools provided opportunities for pediatric concussion training and have school-wide concussion response protocols in place. However, the data revealed that the participants' abilities to identify concussion symptoms from a list did not

translate into confidence in their ability to generalize the information in the event a suspected concussion occurs during the school day. In addition, more than half of the participants indicated that they do not feel adequately trained and are not confident that their level of training is sufficient enough to properly address the academic needs of a student with a documented concussion. Graves et al. (2018) explained that children in rural communities who receive health care services following a concussion will do so at an increased price when compared to urban communities. In addition, this population is less likely to seek health care services (Graves et al., 2018). Given the unique health care disparities existing between urban and rural communities, it is important that research looks specifically at these rural areas to learn how to best support educators, students, and families. In order to compensate for the health care inequalities afforded to rural communities, this population should empower themselves with knowledge pertaining to concussion identification and response.

The results of the survey provided information that is beneficial for future staff training in the area of pediatric concussion identification and management. By promoting awareness of the need for early identification and proper management of concussion incidents, the likelihood increases that children recovering from a concussion will receive the individualized medical and academic support they require. This, in turn, can drastically reduce the length of symptom duration, as well as the length of overall recovery time.

CHAPTER FIVE: REFERENCES

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APPENDIX A: SUPERINTENDENT RECRUITMENT LETTER

Western Carolina University | Department of Communication Sciences and Disorders

August 21, 2019

Dear _____,

My name is Lindsay Stewart and I am a graduate student in the Communication Sciences and Disorders Program and Western Carolina University. After spending eight years as a classroom teacher in North Carolina, I have decided to change paths and work towards becoming a speech-language pathologist. For my thesis, I am conducting a research study about rural elementary staff awareness of pediatric concussions. I would like to ask for your permission to allow the teachers in your district to participate in an anonymous survey. The survey consists of about 15 questions, will take less than 3 minutes to complete, and is mobile-device compatible.

Data obtained will guide our development of school resources related to pediatric concussion that will be available for download at no cost. The information will include concussion identification information, environmental modification recommendations that are beneficial to students recovering from a concussion, and suggestions for a school-wide protocol that can be applied in the event a child is suspected of receiving a concussion during the school day.

With your permission, I would like to contact the elementary school principals in your district and ask that they forward the survey link to their staff. If you have any questions, please contact me at lmstewart11@catamount.wcu.edu, or you may contact my thesis advisor, Dr. Leigh Odom at kmodom@email.wcu.edu. Thank you for your time. I look forward to hearing from you.

Sincerely,

Lindsay Stewart

Lindsay Stewart
lmstewart11@catamount.wcu.edu
CSD Graduate Student
Western Carolina University

Dr. K. Leigh Odom, Ph.D., CCC-SLP
kmodom@email.wcu.edu
CSD Associate Professor
Western Carolina University

APPENDIX B: PRINCIPAL RECRUITMENT LETTER

Western Carolina University | Department of Communication Sciences and Disorders

September 12, 2019

Dear _____ County Principals,

My name is Lindsay Stewart and I am a graduate student in the Communication Sciences and Disorders Program and Western Carolina University. I am contacting you with the permission and encouragement of your Superintendent, _____. After spending eight years as a classroom teacher in North Carolina, I have decided to change paths and work towards becoming a speech-language pathologist. For my thesis, I am conducting a research study about rural elementary staff awareness of pediatric concussions.

Following the conclusion of the study, I will be developing a resource packet related to pediatric concussion applicable to the school environment. The information will include concussion identification information, environmental modification recommendations that are beneficial to students recovering from a concussion, and suggestions for a school-wide protocol that can be applied in the event a child is suspected of receiving a concussion during the school day.

I would like to ask for your participation by forwarding your staff this email to give them access to the anonymous survey link below. The survey consists of about 15 questions, will take less than 3 minutes to complete, and is mobile-device compatible. Thank you for your time. I look forward to hearing from you.

Survey Link: https://wcu.az1.qualtrics.com/jfe/form/SV_3HFYJ94j6BhNN8F

Sincerely,

Lindsay Stewart

Lindsay Stewart
lmstewart11@catamount.wcu.edu
CSD Graduate Student
Western Carolina University

Dr. K. Leigh Odom, Ph.D., CCC-SLP
kmodom@email.wcu.edu
CSD Associate Professor
Western Carolina University

APPENDIX C: SURVEY

Western Carolina University
Consent to Participate in a Research Study
Project Title: Rural Elementary School Staff's Knowledge of and Experience with Pediatric Concussion

Investigators:
Dr. Leigh Odom, Associate Professor of Communication Sciences and Disorders at Western Carolina University
Dr. Melissa Snyder, Program Director and Associate Professor of the Athletic Training Program at Western Carolina University
Lindsay Stewart, Master of Communication Sciences and Disorders candidate

Description and Purpose of the Research:
Concussions can cause persistent cognitive, physical, and behavioral consequences in developing brains. The purpose of this study is to assess the concussion awareness of rural elementary school staff as it relates to concussion identification and symptom management. In addition, the research will determine the frequency with which elementary schools in these rural communities have a school-wide concussion protocol in place. As researchers and practicing speech-language pathologists, we are interested in learning more about how we can support school systems in identifying and managing concussion symptoms in educational settings.

What you will be asked to do:
Our research includes an anonymous survey for you to complete. The survey can be completed online in less than 3 minutes.

Risks and Discomforts:
Participating in this survey requires minimal time and there are no foreseeable risks. However, feel free to contact the researchers with the information provided below if you have any questions.

Benefits:
Following the conclusion of the study, participating schools will be provided with pediatric concussion information that can be applied in the school environment. The information will include concussion identification information, environmental modification recommendations that are beneficial to children recovering from a concussion, and suggestions for a school-wide protocol that can be applied in the event a child is suspected of receiving a concussion during the school day.

Privacy/Confidentiality/Data Security:
Participant data will be anonymous, meaning that not even the primary research team will know of your participation and responses. When data is presented, only summaries of group data will be shared.

Voluntary Participation:
Participation is voluntary and you have the right to withdraw your consent or discontinue participation at any time without penalty. You also have the right to request that your data not be included in the study.

Compensation for Participation:
There is no compensation for participation in this study. We express our gratitude to those who would like to share their information through the survey presented, and look forward to helping elementary school staff properly identify and manage pediatric concussions.

Contact Information:
For questions about this study, please contact Lindsay Stewart at lmstewart11@catamount.wcu.edu.

You may also contact Dr. Leigh Odom, the principal investigator and faculty advisor for this project, at kmodom@email.wcu.edu.

If you have questions or concerns about your treatment as a participant in this study, you may contact the Western Carolina University Institutional Review Board through the Office of Research Administration by calling 828-227-7212 or emailing irb@wcu.edu.

I understand what is expected of me if I participate in this research study. I have been given the opportunity to ask questions, and understand that participation is voluntary. By checking "I agree" below, I am showing that I agree to participate and am at least 18 years old.

- ○ I agree. I want to participate.
- ○ I do not agree. I do not want to participate.

Please select the county of your current school district:

Alexander	Burke	Clay	Jackson	Mitchell	Transylvania
Alleghany	Caldwell	Graham	Macon	Polk	Watauga
Ashe	Catawba	Haywood	Madison	Rutherford	Wilkes
Avery	Cleveland	Henderson	McDowell	Swain	Yancey
Buncombe	Cherokee				

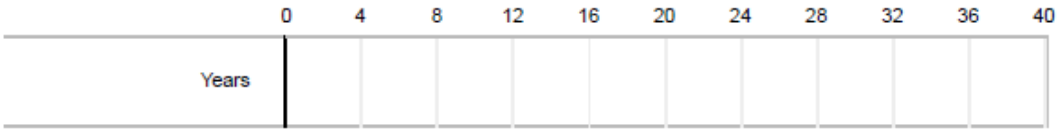
What best describes your current position?

- Classroom Teacher
- EC Teacher
- Teaching Assistant
- Specialist (e.g., Art Teacher, P.E. Teacher)
- Administration/ Administrative Assistant
- Nurse/ Counselor
- Other

With what grade level do you spend the majority of your day?

- Kindergarten
- First Grade
- Second Grade
- Third Grade
- Fourth Grade
- Fifth Grade
- All Grades
- No Grades
- Other

How many years have you been employed in any role by a K-12 school system?



Please rate your confidence in recognizing concussion symptoms in students.

- ○ Extremely confident
- ○ Somewhat confident
- ○ Not at all confident

From the list below, please identify the symptoms that can be associated with a concussion diagnosis:

	Please Make a Selection for Each Symptom		
	Yes	No	Don't Know
Runny Nose	○	○	○
Headache	○	○	○
Color Blindness	○	○	○
Nausea	○	○	○
Vomiting	○	○	○

From the list below, please identify the symptoms that can be associated with a concussion diagnosis:

	Please Make a Selection for Each Symptom		
	Yes	No	Don't Know
Changes in Personality	○	○	○
Mood Changes	○	○	○
Color Blindness	○	○	○
Confusion	○	○	○
Sensitivity to Light	○	○	○

From the list below, please identify the symptoms that can be associated with a concussion diagnosis:

	Please Make a Selection for Each Symptom		
	Yes	No	Don't Know
Changes in Allergic Reactions	○	○	○
Memory Problems	○	○	○
Dizziness	○	○	○
Balance Problems	○	○	○
Ear Infection	○	○	○

From the list below, please identify the symptoms that can be associated with a concussion diagnosis:

	Please Make a Selection for Each Symptom		
	Yes	No	Don't Know
Comprehension Delays	○	○	○
Trouble Sleeping	○	○	○
Trouble Staying Awake	○	○	○

Please rate your confidence in properly managing/accommodating students with concussion symptoms in your classroom.

- ○ Extremely confident
- ○ Somewhat confident
- ○ Not at all confident
- ○ Not applicable given my job responsibilities

To your knowledge, have you ever taught a student who was recovering from a documented concussion?

- ○ Yes
- ○ No
- ○ Not applicable given my job responsibilities

Have you ever taught a student who you think had a concussion that was not documented?

- Yes
- No
- Not applicable given my job responsibilities

Are staff (e.g., coaches, athletic educators, recess supervisors) at your school required to inform teachers when a student has experienced an event that could have resulted in concussion?

- Yes
- No
- Not sure

In your current job, have you ever received training related to concussion (e.g., workshop, lecture, fact sheet, brochure)? If yes, please briefly explain.

- Yes
- No

Does your current school have a protocol in place to manage a concussion incident?

- Yes
- No
- Not sure

Have you received training on this protocol?

- Yes
- No

How frequently do you receive this training?

- ○ Every day
- ○ Every week
- ○ Every month
- ○ Every year
- ○ It happened once and was not repeated
- ○ Other

Please describe the concussion protocol training.

Who facilitated the concussion protocol training? For example, the school nurse or P.E. teacher.

Do you feel you need more information/training about what to do if you **suspect** a concussion in one of your students?

- ○ Yes
- ○ No

Do you feel you need more information/training about what to do if one of your students has a **confirmed** concussion?

- ○ Yes
- ○ No