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Trauma-Informed Practices in Rural Education

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The overall wellness and well-being of today's youth are of concern owing to high levels of stress, as well as other mental and physical health issues. Academic success can be negatively impacted because of the interconnectivity of these issues, along with traumatic childhood experiences and high numbers of adverse childhood experiences. In rural areas, these issues can be even more pronounced owing to issues related to socioeconomic status and high rates of poverty. Therefore, it is important to explore interventions in the educational setting that could mitigate the negative impact of these challenges. This pilot study examined the relationship between a trauma-informed approach incorporating yoga/mindfulness and academic, social, and emotional behaviors among fourth graders in a rural academic setting. Student and teacher pre- and postintervention survey data indicate the intervention had academic, social, and emotional benefits.

***Keywords*: trauma, rural education, adverse childhood experiences, yoga, stress**

The overall wellness and well-being of today's youth are of concern due to high stress levels, as well as other mental and physical health issues (Cook-Cottone, 2017). Many children find it difficult to succeed academically when their experiences outside the classroom involve mental and physical health challenges interconnected with issues related to socioeconomic status, traumatic childhood experiences such as abuse or neglect, and high rates of poverty. For example, in the county where this research took place, 46.5% of students were eligible for free and reduced lunch during the 2016–2017 academic year (Annie E. Casey Foundation, 2019); similarly, 47.3% of children in the same county in 2011–2015 were living in deep poverty, that is, in households whose income is 50% or more below poverty income level ($12,125 for a family of four in 2015; Annie E. Casey Foundation, 2019). In terms of traumatic childhood experiences, there were 146 verified cases of abuse in the same county between July 1, 2016, and June 30, 2017, most of which were for physical neglect (Virginia Department of Social Services, 2017).

While poverty does not imply neglect or abuse by any means, when the two co-occur the student is doubly disadvantaged, as was the case in this research setting with many of the participants. Even youths not experiencing these types of challenges are attempting to cope with external stressors; therefore, it is imperative to provide all students, and especially those facing adversity, with tools for stress reduction and self-regulation (Burke-Harris, 2018). According to research, yoga and mindfulness can greatly benefit all students in these areas (Butzer, van Ovfer, Noggle Taylor, & Khalsa, 2015; Cook-Cottone, 2017; Khalsa, Hickey-Schultz, Cohen, Steiner, & Cope, 2012).

Kaiser Permanente and the ACE Study

The impetus for this research project stems from the landmark Centers for Disease Control and Prevention (CDC)–Kaiser Permanente Adverse Childhood Experiences (ACE) Study conducted in 1995–1997. In this study, over 17,000 mostly white, college-educated, employed adults were screened for prominent childhood traumatic experiences as

part of their routine health care at Kaiser. A staggering number of respondents reported some form of abuse, neglect, and/or household dysfunction (Felitti et al., 1998). Because of these shocking study results, the CDC continues ongoing surveillance of adverse childhood experiences (ACEs) by assessing the medical status of the study participants (CDC, 2016). Additional research is investigating how children exhibit symptoms of ACEs in their youth; current symptomatology includes excessive disciplinary referrals and chronic absenteeism, which was the motivation for this pilot study.

Children experiencing traumatic events often display their symptoms outwardly, in various forms. Students can have difficulty with managing "big" emotions and experience chronic irritability and anxiety that interferes with problem solving. They also have difficulty expressing empathy for others, being able to express their concerns and needs in words rather than the wider context of a situation, lack the ability to appreciate how their behavior impacts other people, and struggle with working productively and positively in groups or connecting with their peers (Bloom, 2007). Further, compared to students with lower ACE scores, students with three or more ACEs are 2.5 times more likely to fail a grade, score lower on standardized tests, and experience more suspension/expulsion; are more likely to be referred to special education; and have poorer physical health, leading to poor attendance. They also have difficulty storing and processing new information, struggle with social communication and perspective taking, and have trouble with problem solving, critical thinking skills, cause-effect relationships, and sequential organization while concurrently wrestling with emotion regulation, which often appears as reactivity and impulsivity or displaying signs of aggression, defiance, withdrawal, and/or perfectionism (Litgen, 2013; Massachusetts Advocates for Children, 2005). These difficulties in higher-order thinking and cognition fall under the theoretical framework of Abraham Maslow's (1943) hierarchy of needs, which posits that children cannot engage in complex learning tasks when threats to physiological/survival needs and/or physical/emotional safety are present. Because children who have experienced ACEs struggle in executive functioning and regulation skills (because of real or perceived threats to safety and survival), this study sought to mitigate these factors to allow students to engage more fully in the cognitive and psychological demands of a typical school day.

In addition to impaired academic and social behaviors, children exposed to trauma also become highly susceptible to many dangerous medical behaviors and health outcomes. Not only can chronic exposure to stress hormones suppress the immune system and lead to autoimmune diseases in children and adults, but also, on average, people with a high ACE score (6 or higher) have life spans shortened by 20 years (Burke-Harris, 2018). Adults who have moderate to high ACE scores (3 or higher) are 242% more likely to smoke, 222% more likely to become obese, 357% more likely to experience depression, 443% more likely to use illicit drugs, 298% more likely to contract a sexually transmitted disease, 555% more likely to develop alcoholism, 400% more likely to develop emphysema or chronic bronchitis, and 1,200% more likely to attempt suicide (Burke-Harris, 2018). These health outcomes potentially lie ahead for all students exposed to traumatic events, but students located in geographically isolated areas are even more likely to experience adverse events than those in urban settings (Talbot, Szlosek, & Ziller, 2016; U.S. Department of Health and Human Services, 2015). Therefore, it is paramount to explore practices that offer the potential to alleviate the impacts of ACEs in school settings.

Community-Based Participatory Methodology

Community-based participatory research (CBPR) was used as the conceptual framework for this study. Kurt Lewin and Paulo Freire laid the foundation for CBPR in the 1930s, when they emphasized an iterative cycle of "action, reflection, and experiential learning" in conducting research in communities (Faridi, Grunbaum, Gray, Franks, & Simoes, 2007, p. 1). Israel, Schulz, Parker, and Becker (2008) defined CBPR as focusing on "social, structural, and physical environmental inequities through active involvement of community members, organizational representatives, and researchers in all aspects of the research process" (p. 173). For the

purposes of our pilot program, we focused on partnering with a local school system and a nearby college within a rural, Appalachian community to address issues surrounding ACEs with local elementary school students. The school district leaders created their own purpose, questions, and aim for the study rather than being guided by our own research agenda. Further, the collaborative process allowed for sharing of resources, making the program more sustainable. Moreover, it was our intent to empower stakeholders to continue action research on children with traumatic exposure after the conclusion of the pilot study while continuing the partnership with our institution (Holkup et al., 2004).

The genesis of the study was through college outreach to the local school system. In this outreach, members of the school district expressed a need to address students with ACEs, particularly those impacted by the opioid crisis in the rural area. Collaboratively, the district and the researchers' institution formed a partnership to launch a pilot program for trauma-informed yoga at the local elementary school. Fourth grade was identified by the district for the study, and since yoga aligned with the state's physical education standards, the program took place during students' physical education classes to encourage participation and retention in the study. School and district leadership, as well as the physical education and homeroom teachers of the fourth-grade students, were actively involved in the implementation and data review processes of the study. Based on the positive outcomes we describe here, the district leadership expressed a desire to continue the study at the middle-level school in the district the following academic year, continuing the collaborative process.

Chronic Absenteeism and the Importance of Physical Activity in Schools

According to a report issued by the Robert Wood Johnson Foundation (2016), students who have experienced trauma are more likely to have higher rates of absenteeism, which are linked to lower academic achievement, and those students are also less likely to graduate (Miller & Johnson, 2016). Additionally, students with chronic absenteeism are more likely to engage in risky behaviors (Miller & Johnson, 2016). As a result, some states are currently working to reduce rates of chronic absenteeism by using trauma-informed practices (Blad, 2016). Particularly in the state of Virginia, in which this study was implemented, efforts to provide promising practices using a trauma-informed lens may also positively impact rates of chronic absenteeism. Chronic absenteeism in Virginia is defined as "being absent for at least ten percent of the days enrolled" (Miller & Johnson, 2016, p. 1). Since most school districts in Virginia follow a 180-day cycle, the number equates to 18 days, or approximately 2 days of absence per month (United Way of Southwest Virginia, 2017). During 2015–2016, the chronic absenteeism rate for public school students in Virginia was 13.8% (Hamilton Project, 2019). This data set defined chronic absenteeism as 15 days or more. In rural areas in Virginia, the rate was 15.3%. In the county in which the research was conducted, the rate was 16.1%.

Multiple factors impact students' chronic absenteeism, including negative experiences at school. According to Liu and Loeb (2016), schools and teachers can sometimes create unpleasant spaces and experiences for youths. For example, in physical education classes, many students report negative experiences related to an overemphasis on team games in which a "pecking order" for choosing teams results in a humiliating experience for students who are less physically inclined (Cardinal, Yan, & Cardinal, 2013). Providing opportunities for physical activity like the yoga activity implemented in this study can have a 2-fold benefit. First, the breathing, stretching, core strength, and flexibility exercises create a positive and supportive environment in which all students were able to succeed. More important, students begin to learn that movement and breathing can be one of many "tools for their toolbox" to help them cope with trauma, poverty, and other challenges to learning that are outside their control. This orientation is very different from many physical education classes within the United States, which place an overemphasis on competition. According to the Society of Health and Physical Educators (SHAPE), appropriate instructional practices for the learning environment include helping children "understand that some students prefer competitive

situations, while others don't; and either preference is acceptable" (SHAPE America, 2009, p. 9). By viewing the issue of chronic absenteeism through a trauma-focused lens in the physical education environment, we can help students ultimately come away with a more positive and rewarding experience that could impact their future participation in physical activity and provide them with coping skills for a lifetime (Cardinal et al., 2013). From a global perspective, other countries are also beginning to explore the potential for promoting mental health within physical education. In Switzerland, a new curriculum for physical education specifically addresses stress management (Lang et al., 2016).

Along with the benefits already discussed, in rural educational environments additional positive outcomes result from providing physical activity informed by a trauma-sensitive approach. According to Talbot et al. (2016), the most common ACE was "childhood exposure to a household member's abuse of alcohol or drugs" (p. 4). Youths residing in rural areas are much more likely to experience the adverse effects of opioid abuse. The National Child Traumatic Stress Network (2018) indicated that rural adolescents were 35% more likely to abuse prescription opioids compared to those residing in large urban areas. For those residing in Virginia, the opioid crisis has resulted in passage of legislation to help combat the epidemic, which includes requirements specifically to use a "trauma-informed approach" to support substance-exposed infants and their caregivers (Tabackman, 2018). Once children become old enough to attend school, experiences employing a trauma-informed lens can continue to support this legislation. Among other neurological and physiological benefits, exercise releases endorphins and helps reduce stress (Cook-Cottone, 2017). Research also suggests that physical activity can serve as one of many tools for a child's toolbox to combat substance abuse in youth (Simonton, Young, & Johnson, 2018). Memory and learning processes, as well as overall psychological well-being, are enhanced with regular exercise.

Rurality and ACEs. In addition to issues of chronic absenteeism, poverty and low educational attainment have long been concentrated in rural areas, as is the case for this study site. The impetus for this study was grounded in the understanding that "trauma can impact the development of social, emotional, and cognitive skills in ways that result in difficulties adjusting to the demands of school" (Jennings, 2019, p. 1). Specific to rural communities, research suggests that challenges are often greater for students in rural settings than for those in more urban or suburban areas (Sanchez, Usinger, Thornton, & Sparkman, 2017; Witherspoon & Ennett, 2011). Educational challenges range from recruiting and retaining qualified, competent, and ethnically diverse teachers to rural poverty, which were described by Stelmach (2011) as a "persistent macrosystemic issues related to rural education" (p. 35).

A 2015 Health Resources and Services Administration report found that rural children were more likely than urban children to experience certain kinds of adversity (U.S. Department of Health and Human Services, 2015), and a 2011–2012 national survey of children's health found that rural children were more likely to experience ACEs than were urban children, in part because rural children are more likely to live in poverty than their urban counterparts (Lukens, 2017). In a recent study, Talbot et al. (2016) found that, while the prevalence of ACEs was comparable in rural and urban adults, over half of rural adults surveyed reported having ACEs. Among those with any ACEs, about one-quarter experienced four or more ACEs (Talbot et al., 2016). In another study, Lukens (2017) reported that over half (56.5%, CI = 55.6–57.3) of rural respondents indicated they had experienced at least one ACE: about one-fifth (21.8%, CI = 21.1–22.6) reported one ACE, 12.0% (CI = 7.7–8.7) reported two ACEs, 8.1% (CI = 7.7–8.7) reported three ACEs, and 14.6% (CI = 13.9–15.2) reported four or more ACEs. Possible explanations for the high prevalence of ACEs in rural center on rural health care environments, which receive inadequate funding, encounter barriers to electronic health records due to unavailability of high-speed internet access, endure limited access to high-quality medical and behavioral health professionals, and suffer from geographic isolationism and lack of proximity to services (U.S. Department of Health and Human

Services, 2015). Older citizens with elevated ACE scores may be less likely to participate in ACE surveys due to higher rates of disability and morbidity relative to their age peers with lower ACE scores, and there also tends to be a prevalence of denial and fear of retribution in these areas on the part of social services providers; these environmental factors and socioeconomic disadvantages, in turn, place rural parents at heightened risk for experiencing behavioral health problems and may increase the possibility of engaging in child maltreatment (U.S. Department of Health and Human Services, 2015).

Another challenge specific to rural educational experiences is the remoteness (Liu, 2004). Distance and cost prohibit individuals from accessing opportunities available in more urban areas. One of those opportunities is the ability to participate in yoga. Yoga studios are usually located in more urban areas and require a monthly membership. Yet research indicates that tension, anxiety, memory, and other measures of well-being are improved in schools that incorporate yoga and mindfulness practices in the curriculum (Cook-Cottone, 2017). The goal of this study was to explore the relationship between academic, social, and emotional behaviors and a trauma-informed approach incorporating tenets of yoga and mindfulness in a rural academic setting.

Yoga as a Trauma-Informed Intervention. Nadine Burke-Harris (2018) proposed that one of the keys to reversing the physiological and psychological impacts of childhood adversity was exercise, along with relaxation techniques like meditation. According to recent studies, yoga and mindfulness can greatly benefit all students, and especially those that have suffered traumatizing experiences (Butzer et al., 2015; Cook-Cottone, 2017; Khalsa et al., 2012). These studies have found positive relationships between physical yoga practices and academic gains, along with a decrease in cortisol levels in children. Middle school students have also reported lower stress levels, higher-quality sleep, and improved academic performance (Butzer et al., 2015; Butzer et al., 2017). Further, exercise causes the release of brain-derived neurotrophic factor, which is paramount for learning and memory in the hippocampus and prefrontal cortex (Burke-Harris, 2018; Ratey, 2008). According to Khalsa et al. (2012), nearly 50 research studies on yoga as a therapeutic intervention have been published in the last 15 years, all reporting positive outcomes. Yoga has also been linked to lowering test anxiety, improving work habits, improving academic performance, promoting emotional intelligence, and facilitating cooperation, while also showing a corresponding reduction in stress levels, heart rates, and blood pressure (Khalsa et al., 2012).

Despite these positive outcomes, there remains limited research on yoga and mindfulness as a therapeutic intervention for students, especially older students and in studies with larger sample sizes and/or longer durations (i.e., longitudinal studies). This study adds to the growing body of research on yoga as a possible intervention for students by determining preliminary findings for academic and behavioral outcomes in a rural setting.

Research Question

For this study, the school district and authors sought to answer this question: Is there a relationship between a trauma-informed approach incorporating yoga/mindfulness and academic, social, and emotional behaviors in a rural academic setting? This question was approached using pre- and postintervention surveys of both students and their teachers to assess student academic, social, and emotional behaviors before and after the intervention protocol.

Methodology

Participant Selection

After approval by Emory & Henry College's Institutional Review Board, the study was conducted for 9 weeks in the spring of 2018, on Mondays and Wednesdays from 8:35 to 9:00 a.m., during specific fourth-grade physical education classes in a rural elementary school in Virginia; more than 95% of these students were Caucasian, and, per school administration, "many" came from low-socioeconomic-status home environments. However, because of the confidential nature of the data, researchers were not privy to individual

student free/reduced lunch information, which is linked to student socioeconomic status.

During this pilot study, instructional guidance for students regarding physically active ways to self-regulate and reduce stress was provided using adaptations of the Yoga Ed (yogaed.com) evidence-based, trauma-informed curriculum (Cook-Cottone, 2017). Due to parental and district-level concerns with possible religious connotations affiliated with the word *yoga*, the researchers deliberately did not use this term. Instead, students were instructed in ways to improve core strength, flexibility, and balance, as well as breathing techniques. Along with teaching these concepts, students were also taught about the neurological effects of trauma and stress in terms of their "upstairs" (limbic and brain stem) and "downstairs" (cerebral cortex) brain (Souers & Hall, 2016).

Experimental Groups

Two experimental groups were included in the study; one homeroom received the intervention twice per week for 9 weeks, and two other homerooms received the intervention once per week for 9 weeks, as a 9-week intervention period is considered typical for school-based interventions. Sessions were limited to 25 minutes each owing to time constraints within each physical education class and were led by the two researchers of this study, who are themselves veteran educators and researchers (one of whom has specific expertise in yoga, physical education, and physical literacy). Additionally, diaphragmatic breathing exercises were incorporated during each session to help strengthen and calm the central nervous system and to improve concentration (Cook-Cottone, 2017). Data were collected via pre/post surveys (adapted from Yoga 4 Classrooms (L. Flynn, personal communication, December 7, 2017); see Appendices A and B for survey instruments) administered to both students and teachers; teachers completed a survey for each student participant. While these instruments have not yet been validated, the researchers felt that, because this was a pilot study, these questions got to the core of what they sought to discover through this initial implementation. As mentioned earlier, the sample population was considered high poverty, and anecdotally, many of these students came from homes characterized as "difficult" by their teachers.

Findings

Three specific fourth-grade classes were involved in the study. One class received the intervention twice per week for 9 weeks. Data were collected from 18 students and the teacher via pre/post surveys. The two other classes received the intervention once per week for 9 weeks. Data were also collected from these classes via pre/post surveys from a total of 38 students (19 per class) and all four homeroom teachers. The survey included questions regarding social, emotional, and academic behaviors, as well as a section for additional comments (see Appendixes A and B). Overall, results from this study were positive in both intervention groups.

Student Pre/Post Survey Data

A descriptive analysis of the data from the pre- and postintervention surveys completed by the students (Figure 1) indicated that, in the social domain, the student perception of behavior improvement was 26.3% overall. The percentage was slightly higher (26.4%) in the class with the twice-weekly intervention than in the classes that received it only once per week (25.9%). In the emotional domain, the amount of student-perceived behavior improvement was 30.4% overall. Interestingly, the percentage was higher in the classes that received the once-weekly intervention (32%) than in the class that received it twice per week (26.7%). In the academic domain, student perceptions of improvement were 29.4% overall. The class that received the twice-weekly intervention had the highest perceived growth in this domain, at 32.1%, compared to 28% for the classes that received it once per week.

Along with the quantitative data, survey data collected qualitatively via written comments also indicated improvement in social, academic, and emotional behaviors of the students. A sample of comments is included in Table 1.

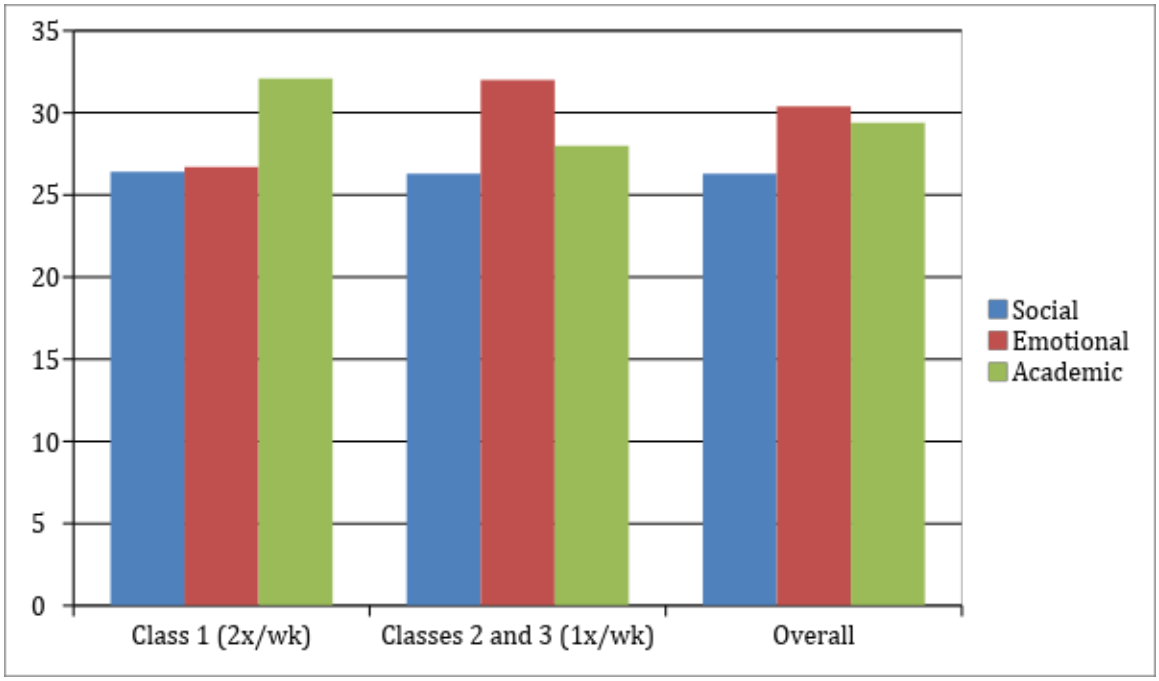

Figure 1. Student perceptions of behavior improvement, percent change

Table 1

Student Postintervention Survey Comments

"I found that the breathing exercises helped me calm down."
"I have stress at home. But I came over stress."
"Your exercises helped me a lot with all the topics. . . . The exercizes [*sic*] helped me to be calm after and to calm down when angry."
"The exercises helped control me a lot at school. :) But sometimes at home I have trouble controlling my anger."
"Sometimes I have anger anxiety and it helped me calm down and also when I'm upset."
"The exercise made me feel happy."
"I have a lot of joy as of the exercises make me happy. I have bad anxiety and stress so this helps me calm down a little. Thank you."
"I liked this, I think it will help when I get mad."

Open-ended comments from students indicate that the intervention was most beneficial in the emotional domain of managing stress, anxiety, and anger. Some students also indicated that the combination of breathing, stretching, flexibility, and balance exercises helped them feel happy.

Teacher Pre/Post Survey Data

An analysis of the pre- and postintervention survey data collected from all homeroom teachers (Figure 2) also indicated positive improvement in the domains of social, emotional, and academic behaviors. In the social domain, the teacher perception of behavioral improvement was 14% overall. The class that received the twice-weekly intervention showed 35.7% improvement. In both classes receiving the intervention only once per week, the teachers' perception of positive social behaviors was only 6.8%. The amount of improvement regarding the emotional domain was 28% overall. In the class that received the twice-weekly intervention, teacher perception of improvement in emotional behavior was 42.9%, compared to 21.3% in the two classes receiving the once-weekly intervention. In the academic domain, the teacher perception was 21% behavioral improvement among the students in all three classes, 31% in the class receiving the twice-weekly intervention, and 17.5% for the classes receiving the once-weekly intervention. Table 2 lists a sample of postintervention survey comments provided by the teachers. Open-ended comments from the teachers indicate that many students appeared happier overall, with positive improvements in attention as well as social and emotional behaviors.

Discussion

Overall, the results of the student and teacher quantitative and qualitative survey were overwhelmingly positive. The quantitative survey data showed improvement across all domains connected to traumatic exposure (social, academic, and emotional behaviors) in both experimental groups among both students and teachers. The homeroom teacher whose students received twice-weekly interventions reported more positive outcomes in every area of the survey than did teachers whose classes received the once-weekly intervention. In this homeroom, 50% of students self-reported improvements in loneliness (social domain), increased creativity in academic problem solving (academic domain), and improved attendance at school for reasons of "not feeling well" (academic domain); 42% of students in this class also reported a decrease in worry (emotional domain). When analyzing pre- and postintervention survey data, both teachers and students reported that the biggest improvements were in student emotional behaviors, followed by academic and social behaviors. In addition to the postintervention qualitative responses included in Table 2, one teacher noted in the preintervention survey comments a student whose father had died at an early age. Upon completion of the study, the teacher commented that the student's social behaviors had improved. With regard to preintervention survey comments provided by students, one noted on that "I am upset sometimes, so I may look upset/angry when I come in." His postintervention survey comments indicated that the intervention had helped him learn strategies for calming down when angry.

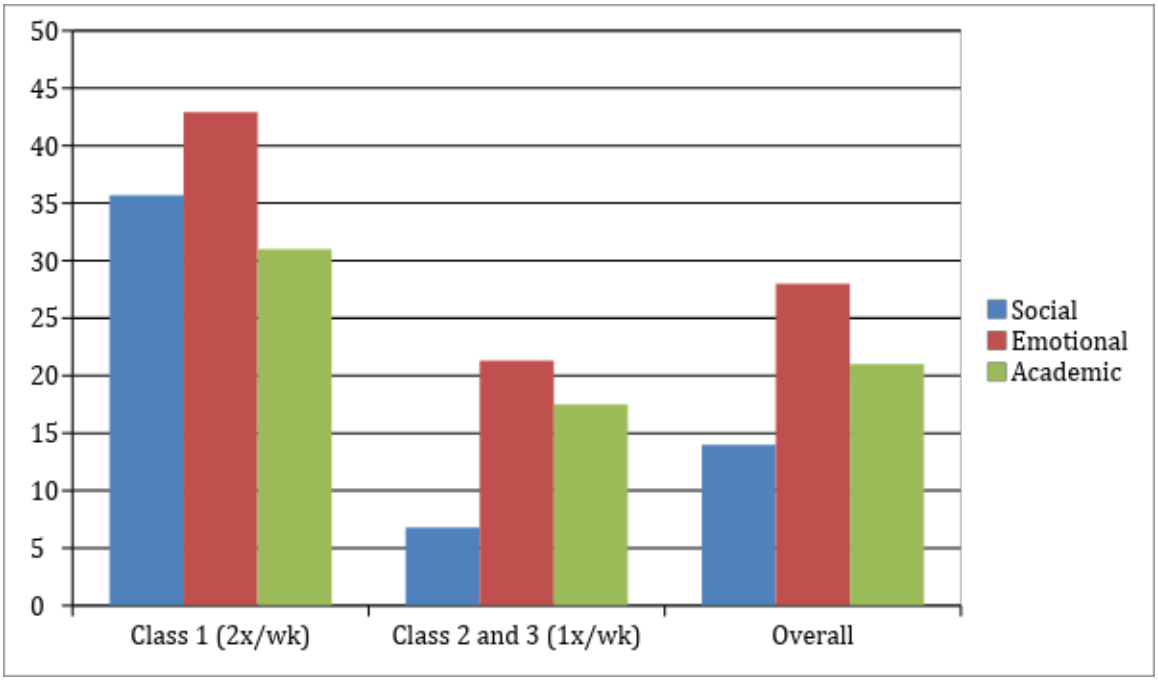

Figure 2. Teacher perceptions of student behavior improvement, percent change

Table 2

Teacher Postintervention Survey Comments

"This student appears happier and less stressed."
"More focused and more social towards the end of the year."
"Saw improvement with attention."
"Emotional and social behavior improved."
"All areas improved."

As noted by Burke-Harris (2018), the first step in creating a trauma-sensitive environment is to understand the impact of trauma and repeated adversity on the stress response, which ultimately leads to toxic stress. The resulting biological and neurological reactions often have a negative impact on the brain, thus setting the stage for various types of challenges, including but not limited to the academic, social, and emotional domains. The intervention in this study provided trauma-sensitive practices incorporating exercise and breath awareness (Burke-Harris, 2018; Jennings, 2019). The incorporation of exercise is beneficial on a variety of levels. According to Tate (2014), positive neurotransmitters in the brain are produced through movement. This is beneficial to the learning process, as indicated by studies showing a correlation between academic improvement and exercise (Ratey, 2008; Tate, 2014). Along with the physical intervention involving core strength, flexibility, and breathing exercises, students were also empowered with information to help them understand what happens in their brains when they begin to feel stressed. Utilizing Souers and Hall's (2016) model of the brain, students were taught how the "downstairs" (limbic and brain stem) and

"upstairs" (cerebral cortex) portions of their brains function. This information is helpful to students who may experience shame, guilt, or low self-esteem resulting from their actions stemming from the adverse effects of trauma (Jennings, 2019).

Study Limitations

This pilot study had multiple limitations due to its exploratory nature. Varying schedules provided difficulties with intervention implementation, such as cancellations due to snow, testing requirements that pulled students from their physical education block, and other changes in the overall school schedule due to special events. This program was only held as a 9-week intervention rather than a semester- or year-long intervention due to various scheduling constraints, so our intervention period was limited. Further, the sample was limited to fourth-grade students only, because of scheduling limitations, so only descriptive and qualitative statistics could be analyzed, as our experimental groups lacked an adequate sample size for further statistical analyses.

Our study also met with resistance from some students and parents among the study demographic, which was primarily Caucasian. According to information provided by the physical education teachers, some students and parents did not provide consent to participate in the pre/post survey data collection because the students did not want to deviate from their normal routine of games. They thought that refusing to participate in the study meant they would not have to participate in the core strength, flexibility, balance, and breathing exercises. However, all students participated in the physical activity, just as they would do for a unit on team sports. Further, because of our fairly homogeneous sample in terms of ethnicity, this study is limited in feedback from minority groups, which indicates a need for this study to be replicated in a more diverse environment.

This school also has a high mobility rate of students (which relates to the population's socioeconomic status and rural setting). Many students provided preintervention data, but then moved to another school/district so postintervention data could not be collected; other students moved to the school during the intervention period. Further, there were multiple student absences during each session of this program; chronic absenteeism, as discussed earlier in this article, impacted the reliability of the results of this pilot study. All absentee individuals provided postintervention data but were unable to provide preintervention data, as all were present for the post-survey but none for the pre-survey. Additionally, no absence data on students were collected, so exact data on specific students and the number of actual treatments received cannot be ascertained.

Lastly, the primary investigators who carried out this research were former K-12 educators (and current college researchers/professors) who followed a trauma-informed yoga curriculum but were not certified trauma-informed yoga instructors. Intended outcomes and perspectives may differ with a certified yoga instructor (or other noneducational professional).

Plans for Future Research and Implications for Practice

After reviewing the qualitative and quantitative data, we suggest that future implementation of this program should increase intervention frequency to a minimum of twice weekly for all students (and possibly increase duration to a minimum of 18 weeks/1 semester). Because results for the twice-weekly intervention group were more positive than for the once-weekly group, further research is needed with increased frequency and/or duration to determine whether a dose-response relationship exists with this protocol. Further, we acknowledge the survey instrument must be streamlined, clarified, and simplified to allow for better understanding, comprehension, and access of information, especially for students with lower reading levels and/or learning disabilities. The identification and implementation of valid survey instrumentation that addresses students' social, emotional, and academic impacts from this intervention is key for reliability and validity of future studies—both for students' and teachers' perceptions of impacts. Teachers also need additional classroom teacher support in the intervention strategy to create carryover and generalization between the physical education classroom and the academic classroom, because

we believe this intervention would be useful in both settings.

More data are needed to determine whether a relationship exists between this approach and academic/standardized assessment outcomes, as well as student attendance. However, the results of this study indicate an alignment with recommendations from the Association for Supervision and Curriculum Development (ASCD) and the CDC calling for a "greater alignment, integration, and collaboration between education and health, 'to improve each child's cognitive, physical, social, and emotional development'" (ASCD, as cited in Cook-Cottone, 2017, p. 26). This study further supports previous research by Cook-Cottone (2017), which suggests that interventions such as mindfulness and yoga can help students self-regulate and engage in ways that promote their overall well-being and ability to learn. For students who have experienced trauma, this type of intervention provides a way to calm their body in order to calm their mind. Many schools place great emphasis on social-emotional learning programs. The results of this research are similar to the findings conducted in those programs, which indicate improvements in social, emotional, and academic endeavors (DiPerna & Elliot, 2002; Durlak, Weissburg, Dumnicki, Taylor, & Schellinger, 2011; Schonfeld et al., 2015).

Along with the positive benefits derived by students, there is also promise for innovative practices in rural pedagogy that could positively impact teachers as well. According to Herman, Hickmon-Rosa, and Reinke (2017), 93% of elementary school teachers feel extremely stressed. Given the current teacher shortage throughout the United States, along with the high rates of reported teacher stress, it could be beneficial for teachers to participate along with their students in the breathing, stretching, and core strengthening activities. Although the study was conducted in a physical education setting, several tenets of the intervention could also be incorporated into a classroom setting.

Additional plans for future research and implementation involve an expansion of this project to other grade levels, especially at the middle level owing to the complex developmental needs of this age group. Implementation in rural and/or high-poverty settings where ACEs are more prevalent is also key, as it is important to determine whether these results are replicable; it would also be worthwhile to implement this intervention with cultural groups that have historical trauma, such as indigenous populations, to determine whether the program produce improved academic and/or behavioral outcomes. We would also like to determine whether student stress levels are reduced physiologically through this intervention, so our future research will include a measure of student salivary cortisol levels before, during, and after intervention. Finally, and perhaps most important, more professional development in trauma-informed care approaches and interventions for teachers and school administrators is vital in creating the necessary support structures for traumatized students to be successful in the school setting.

Conclusion

As indicated by data collected in this study, using a trauma-informed approach resulted in improvements in academic, social, and emotional behaviors through the implementation of physical activity specific to self-regulation and stress reduction. The yoga and mindfulness intervention helped regulate and manage stress and anxiety, as well as manage anger, for the fourth-grade students attending a rural school in Virginia. Along with the physical activity instruction, students were also educated in how their brains and bodies react to stress. By teaching students about their "upstairs" and "downstairs" brain and the subsequent actions and reactions (Siegel & Bryson, 2011), this can also help minimize children's negative self-labeling.

The trauma-informed lens is very beneficial in creating "an effective professional development system that will result in schools incorporating trauma-sensitive practices" (Montana Healthcare Foundation, 2017, p. 10). The importance of this research cannot be understated. According to a recent study published in the *Journal of the American Medical Association*, the prevalence of childhood trauma should now be considered a public health crisis (Copeland et al., 2018). As recognition of the importance of trauma-informed

approaches continues to gain momentum, it is important to research and explore options that provide benefits in the educational setting. Specifically, in rural communities it is vitally important to continue exploring innovative practices to foster student success.

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Appendix A

Student Pre/Post Survey Instrument (adapted from Yoga 4 Classrooms (L. Flynn, personal communication, December 7, 2017)

*Note: Students self-scored (and teachers scored each individual) based on a Likert scale of 1-5, with 1 rated as “not at all” and 5 rated as “a great deal.”

Social Domain
1. I get along with classmates easily.
2. I respect others’ property, opinions, and personal space.
3. It’s easy for me to control my reactions.
4. I get angry with others easily.
5. I feel lonely.
6. I get in trouble at school.
Academic Domain
7. It’s easy for me to pay attention in class.
8. I can easily concentrate on an assignment.
9. I get easily distracted in class.
10. It’s easy for me to come up with creative solutions to problems.
11. Learning comes easily for me, and I make good grades.
12. I have a hard time remembering things.
13. I miss school a lot because I don’t feel well.

Emotional Domain
14. I handle stress/anxiety well, like during big tests or presentations in school.
15. I consider myself a confident person.
16. I worry a lot.
17. I have a hard time calming down when I get upset.
18. In general, I feel happy.

Appendix B

Teacher Pre/Post Survey Instrument (adapted from Yoga 4 Classrooms)

Social Domain
1. Displays positive social interaction with classmates.
2. Shows respect for others.
3. In control of their behavior (e.g., be less reactive).
4. Ability to manage their anger.
Academic Domain
5. Has adequate attention span for instructional tasks.
6. Can concentrate on work.
7. Can stay on task.
8. Exhibits creativity in academic work.
9. Exhibits strong academic performance.
Emotional Domain
10. Can deal appropriately with stress and anxiety (e.g., during test taking or similar events).
11. Exhibits confidence/self-esteem.
12. Is usually in a positive mood.