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ORIGINAL PAPER

Exploring the Efficacy of a School-based Mindful Yoga Program on Socioemotional Awareness and Response to Stress among Elementary School Students

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Abstract

The purpose of this study was to examine the effectiveness of a school-based mindful yoga program on socioemotional competence and response to stress among youth. Participants in this quasi-experimental study included 112 5th and 6th grade students from three private Catholic elementary schools located in Philadelphia, Pennsylvania. Students in the intervention group received weekly lessons in mindfulness-based practices across the year from trained child yoga instructors. Participants completed self-report measures on empathic awareness, perspective-taking, and involuntary engagement with stress at pre- and post-test. Analyses suggest that the program was beneficial in preventing significant increases in rumination and intrusive thoughts for students in the intervention group. Physiological and emotional arousal also remained low among the intervention group, but the differences were not significant. Contrary to expectations, levels of empathic awareness and perspective-taking remained stable in the intervention group while increases were reported among students in the control group. School-based mindful yoga programming may support involuntary stress responses among youth and contribute to more informed self-reported socioemotional awareness.

Keywords Empathy · Perspective-taking · Stress · Yoga · Mindfulness

Highlights

- Examined the benefits of a mindfulness program infused into classrooms across the year within Catholic elementary schools.
- Findings suggest that school-based mindful yoga may protect against increases in rumination and intrusive thoughts during middle childhood.
- Participation in mindful yoga was not associated with growth in empathy.

Introduction

Students today face a variety of challenges both within and outside of the school setting. Those living in low-income, ethnically diverse neighborhoods are often at greater risk for experiencing adversities regularly associated with living at or near the poverty line (Dariotis et al., 2015; Mendelson et al., 2010, 2013). These potential adversities include unstable or insufficient parental income/employment, low-quality home environment, physical and emotional abuse, as well as violence at home and in the surrounding community (Costello & Lawler, 2014; Dupere et al., 2010; Leventhal & Brooks-Gunn, 2000). Exposure to such experiences can contribute to increases in both externalizing and internalizing behavior problems, deficits in executive function, difficulties in regulatory processes, as well as impairments in social-emotional development (Dupere et al., 2010; Flook et al., 2010; Mendelson et al., 2010; Poehlmann-Tynan et al., 2015). Given that there are several academic milestones that all students need to meet, helping students exposed to potentially stressful environments is of utmost importance as it may be harder for them to reach their academic goals. These students have an increased

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likelihood of experiencing possible difficulties with their academic performance, including material comprehension, test taking, goal attainment, and the ability to focus on and complete the lesson or task at hand (Dariotis et al., 2015; Napoli et al., 2005; Schonert-Reichl et al., 2015). Thus, finding a way to help students, especially those within diverse urban contexts, deal with the stressors that they may encounter daily is crucial to their success in school and their general wellbeing.

In recent years, contemplative and mindful awareness practices, or MAPs, have become an increasingly popular and effective means of alleviating many of the emotional and behavioral challenges that young students may endure daily (Butzer et al., 2015; Flook et al., 2010; Khalsa & Butzer, 2016; Napoli et al., 2005). Mindfulness is defined as an "awareness, cultivated by paying attention in a sustained and particular way; on purpose, in the present moment, and non-judgmentally" (Kabat-Zinn, 2012, p. 1). In other words, being mindful refers to having the ability to focus and maintain your attention on your present moment experiences as they are happening without wishing for things to be different in any way. Building a consistent mindfulness practice, much like how one would do when playing or learning an instrument or sport, will lead to quicker recognition of mindless activity and redirection back to the present moment at hand (Davidson & McEwen, 2012; Flook et al., 2010). This regulation of attention has benefits for students' concentration, self-monitoring, and emotional arousal (Mendelson et al., 2010; Napoli et al., 2005; Roeser & Peck, 2009; Tarrasch, 2018). Moreover, those who practice mindfulness learn to stop placing subjective labels (e.g., good, bad, right, wrong) on their experiences, thoughts, and feelings, as doing so increases excessive rumination which is a common response to stress for youth (Costello & Lawler, 2014). Given that rumination increases the risk of both externalizing and internalizing problems, particularly anxiety and depression (Rood, et al., 2009; Verstraeten et al., 2011; Wadsworth et al., 2005), mindfulness also promotes mental health outcomes among youth by decreasing rumination and other problematic responses to stress (Kallapiran et al., 2015; Mendelson et al., 2010; Pepping et al., 2016; Tan & Martin, 2013).

Theoretical Framework

Mindfulness practices include exercises that employ different breathing exercises, muscle relaxations, body scans, attentive listening, sitting and moving meditations, and other activities with the breath as a principal component, such as yoga or Tai-Chi (Burke, 2010; Flook et al., 2010). These practices foster attention to and awareness of ones' thoughts, emotions, and bodily sensations and promote one's ability to be cognizant of their actions, thereby reducing the occurrence of automatic emotional and/or behavioral responses that are detrimental to learning and social interaction (Greenberg & Harris, 2012; Rechtschaffen, 2014). For example, according to the Mindful and Yogic Self as Effective Learner model (MY-SEL; Cook-Cottone, 2017), mindfulness-based practice supports awareness and acceptance of one's internal cognitive, emotional, and physiological experiences, as well as promotes intentional, reflective engagement with the external environment. Thus, mindfulness cultivates skills that are critical for both independent learning (e.g., self-regulation and self-care) and collaborative learning (e.g., social awareness and compassion for others), and supports integration and attunement between these systems (Cook-Cottone, 2017).

Similarly, the Basic Levels of Self (BLoS) model highlights the important role of the I-self, the level of self that is volitional and associated with mindful awareness, in self-regulated learning and moral living (Roeser & Peck, 2009). Through mindfulness practice, individuals learn to consciously shift and sustain the focus of their awareness on objects of consciousness (e.g., thoughts, ideas, feelings) without attachment or judgment. When individuals can separate their awareness from their stream of consciousness, there is an opportunity for intentional control over the more automatized ways of responding that originate from temperamental reactivity or biased beliefs about one's abilities. In this way, mindfulness facilitates the effortful regulation of attention and behavior that is consistent with one's learning goals as well as cultivates character qualities that include empathy and compassion for the self and others (Roeser & Peck, 2009). Indeed, mindfulness has been found to increase one's level of empathy and compassion, allowing for one to better understand another's emotions, be a source of support and understanding, and see multiple perspectives in different situations (Broderick & Frank, 2014; Dahl et al., 2015; Metz et al., 2013; Poehlmann-Tynan et al., 2015). Thus, mindfulness-based practice is now considered an important tool and educational strategy for promoting social-emotional learning (SEL; Broderick & Jennings, 2012; Butzer et al., 2016; Lawlor, 2014).

Yoga

As a distinct mindfulness-based practice, yoga can be thought of as a "full-bodied, three-hundred-and-sixty-degree musculo-skeletal conditioning that naturally leads to greater strength, balance, and flexibility as you practice" (Kabat-Zinn, 2017, p. 517). It combines a focused attention on both the breath and a series of poses, or asanas as they are traditionally called, that strengthen and stretch the body

(Mendelson et al., 2010; Kabat-Zinn, 2017). Breath awareness is a critical component of yoga as it is that focused attention and the quality of the breath that accompanies the movement that truly makes the practice mindful (Kabat-Zinn, 2017). The cultivation of this mindful awareness occurs as the body is flowing through a series of postures/asanas or while holding a particular position (Sauer-Zavala et al., 2013). Although there are over 84,000 primary yoga postures/asanas, a basic yoga practice involves a minor compilation of sequences in comparison that can be taught to youth of all ages (Galantino et al., 2008; Kabat-Zinn, 2017; Mendelson et al., 2010; Razza et al., 2013). The benefits of a mindful yogic practice for youth mirror those found in mindfulness-based activities in general including enhanced stress management and improved self-regulation (Galantino et al., 2008; Mendelson et al., 2010, Razza et al., 2013).

Social-Emotional Learning

Mindful awareness practices and programs are considered a subset of social-emotional interventions, as they encourage the development of key skills including self-regulation, attunement, and awareness (Elias & Moceri, 2012; Gulati et al., 2019; Poehlmann-Tynan et al., 2015). These skills are vital not only to being able to control your own emotional reactivity, but to also recognize the emotions of others and respond appropriately to their needs. Additionally, there are number of other skills determined by CASEL – the Collaborative for Academic, Social, and Emotional Learning – that are necessary for success both in and outside of the classroom that include self-awareness, self-management, social awareness, relationship skills, and responsible decision making (CASEL, 2013). Social-emotional learning essentially refers to the process by which individuals attain the knowledge and skills necessary to handle life's challenges. Thus, the goals of mindfulness-based practice and social-emotional learning overlap, as both approaches emphasize common intrapersonal and interpersonal skills associated with resilience and wellbeing (Lawlor, 2014).

Establishing a mindfulness-based practice for children in grades as early as pre-kindergarten has been found to make a noticeable impact across several important areas including attention, self-regulation, and prosocial behaviors (Flook et al., 2015; Poehlmann-Tynan et al., 2015; Razza et al., 2013; Suárez-García et al., 2020). Furthermore, programs that include both mindfulness and SEL components have been effective in improving grades (Bakosh et al., 2015), enhancing self-regulatory skills (Mendelson et al., 2010), and increasing caring and respect for others (Black & Fernando, 2014) among elementary school students. While the cognitive and behavioral benefits of mindfulness-based practice in schools are reflected in recent meta-analytic studies (Felver et al., 2016; Khalsa & Butzer, 2016; Klingbeil et al., 2017; Serwacki & Cook-Cottone, 2012; Zenner et al., 2014; Zoogman, et al., 2015), there is a need for additional research examining the specific mechanisms underlying these benefits.

Mindfulness-based SEL programs for youth tend to focus on emotional regulation and recognition as well as perspective-taking (Greenberg & Harris, 2012; Poehlmann-Tynan et al., 2015; Shapiro et al., 2015). These programs aid in the development of regulation skills that are critical to social competence and empathy. This is due to the purported influence mindful awareness practices has on the neural wiring that underlies both automatic and controlled aspects of emotional regulation (Shapiro et al., 2015). Certain mindful awareness practices encourage youth to engage in reflective thinking to increase their own subjective awareness which may in turn help them understand how other children may feel in similar situations thus cultivating empathy (Shapiro et al., 2015). In addition to guided visualizations, other programs use the reimaging or retelling of classic fairytales and other stories from the perspective of the antagonist to foster perspective-taking (Shapiro et al., 2015). The "Roots of Empathy" program that was evaluated by Schonert-Reichl and colleagues (2012) has lessons that focus on perspective-taking as it relates to monthly visits made to the classrooms by their room's "adopted" infant and their parent. Apart from these studies, there is limited knowledge of interventions that target perspective-taking skills in children.

Empathy and Perspective-Taking

Empathy is a multifaceted construct that is conceptualized as having both cognitive and affective components, that at its core, relate to experiencing concern for others (Bernhardt & Singer, 2012; Davis, 1983; Schonert-Reichel et al., (2012); Van der Graaff et al., 2018). The affective component entails having the ability to vicariously experience or feel the emotions of another person that evokes an emotional reaction on the part of the observer while the cognitive component encompasses the ability to understand and take on another person's point of view (i.e., perspective-taking) as well as having the ability to discern and identify emotional states in others (Davis, 1983; Schonert-Reichel et al., (2012); Van der Graaff et al., 2018). According to Davis (1983), there is also a "fantasy" component to cognitive empathy that deals with an individual's ability to put themselves into the shoes of fictitious characters from books, movies, and plays. Both empathy and perspective-taking fall under the SEL domain of social awareness and within this domain, there is an added emphasis on being

able to experience empathy for those who are from backgrounds and cultures that are different from one's own (CASEL, 2013). Relatedly, both empathy and perspective-taking underscore prosocial behaviors, which are voluntary actions taken to benefit or assist others (Schonert-Reichl et al., 2012; Van der Graaff et al., 2018; Davis & Carlo, 2018).

There is a lack of research that specifically explores the development of empathy and perspective-taking skills in youth from at-risk environments. Given their disproportionate tendency to experience higher levels of stress, as they are often exposed to greater instances of economic instability, poor housing quality, and other limited resources, these youth may experience deficits in their cognitive and emotional resources (Davis & Carlo, 2018). These deficits in turn may account for their poor emotional regulation (Mendelson et al., 2010) and increase their risk for behavioral problems that may inhibit their ability to display these prosocial behaviors including empathy (Garner, 1996; Zonneveld, 2017). Research suggests that participating in mindfulness-based programming may, however, promote cognitive and emotional regulatory capacities for children from disadvantaged backgrounds who demonstrate lower levels of functioning in these areas (Black & Fernando, 2014; Long et al., 2018; Mendelson et al., 2010; Schonert-Reichl & Stewart Lawlor, 2010; Semple et al., 2010). Moreover, there is evidence that children from at-risk environments may benefit the most from such programming in comparison to their counterparts from more financially stable homes and neighborhoods (Flook et al., 2010, 2015; Poehlmann-Tynan et al., 2015; Razza et al., 2013; Rochette & Bernier, 2014). Explicit reasons for this finding have not been thoroughly explored, but differential susceptibility, or more specifically plastic variability, could perhaps be at play here as children from a disadvantaged or lower socioeconomic status may be able to improve these capabilities when given access to critical resources, such as sensitive parenting or social-emotional curricula (Raver et al., 2013).

Stress and Stress-Related Responses

Exposure to excessive stress during early adolescence can lead to significant disruptions in one's academic performance, negatively impact on their cognitive and emotional regulatory abilities, and result in chronic health issues in adulthood (Bluth et al., 2016; Byrne et al., 2007, Dupere et al., 2010; Grant et al., 2006, Mendelson et al., 2010). Stress, as defined by Lazarus and Folkman (1987), is the relationship between a person and the environment that is assessed as being too overwhelming for them to handle (as cited in Grant et al., 2003, p. 448). For youth from at-risk environments, it is imperative that they improve their emotional regulatory abilities and develop sufficient coping skills to combat the negative effects of stress as it determines how well they can adapt and shift to a more promising outcome (Compas et al., 2001). Without adequate coping skills, these youth are more inclined to have maladaptive, involuntary responses to stress that are not always under their control. Involuntary reactions or responses to stress, as defined by Connor-Smith et al., 2000, includes several different components, namely, rumination, physiological arousal, emotional arousal, involuntary action, and intrusive thoughts. Rumination is defined here as passive and repetitive fixation on the symptoms and causes of psychological distress (Nolen-Hoeksema et al., 2008; see Smith & Alloy, 2009 for alternative conceptualizations of rumination). Physiological arousal pertains to somatic complaints and reactions while emotional arousal covers affective responses or reactions to stress, in other words, how you feel when faced with a stressful situation. Involuntary actions to stress are automatic reactions that don't involve conscious effort or thought (Connor-Smith et al., 2000). Finally, intrusive thoughts are pervasive thoughts, images, or impulses (Kuhn et al., 2013). Such stress responses can lead to increased instances of internalizing and externalizing behavioral problems like depression, anxiety, and substance use among youth from at-risk environments (Anyan & Hjemdal, 2016; Costello et al., 2011; McLaughlin & Hatzenbuehler, 2009; Mendelson et al., 2010; Romeo, 2017).

Mindfulness-Based Programming in Faith-based Schools

An additional limitation of previous research is that we know little about the effectiveness of secular mindfulness-based programs in parochial schools. Specifically, while there have been numerous recent menta-analyses examining the impacts of mindfulness-based interventions in schools, only two of the studies included across all of these reviews were conducted in schools with religious affiliations (Felver et al., 2016; Zenner et al., 2014; Zoogman et al., 2015). The first study implemented the Learning 2 BREATHE curriculum in a suburban private Catholic high school for girls in the United States; seniors in the program demonstrated significant improvements in emotion regulation compared to their peers in the control group and reported high levels of program satisfaction (Broderick & Metz, 2009). The second study examined the effectiveness of a modified MBSR program among fourteen- and fifteen-year-old boys attending two private religious schools in the United Kingdom (Huppert & Johnson, 2010). Although there were no significant differences in wellbeing outcomes between

students in the intervention and control group, among boys in the program, there was a positive association between the amount of individual practice outside of school and increased general wellbeing. There was substantial variation across these two studies in terms of intervention implementation and format, as one examined a 6-lessson curriculum facilitated by an outside instructor (Broderick & Metz, 2009), while the other offered a 4-session program facilitated by classroom teachers who were mindfulness practitioners (Huppert & Johnson, 2010). These differences, along with the predominantly higher SES and white samples, limit the generalizability of the findings to other parochial settings. Thus, although faith-based schools may support contemplative practice implicitly via their pedological approach or explicitly in certain religious practices (Garrison Institute, 2005), there is limited research on how secular mindfulness may complement their efforts.

The Current Study

The purpose of the current study was to evaluate the effectiveness a mindfulness-based yoga program on empathy, perspective-taking, and involuntary responses to stress among children attending urban Catholic elementary schools. Analogous with similar efficacy studies pertaining to yoga and mindfulness-based programming in the school setting (Feagans Gould et al., 2012; Mendelson et al., 2010), it was hypothesized that students partaking in the Mindfulness Through Movement (MTM) program would experience significant increases in their empathic ability and perspective-taking skills. Based on other mindful yoga programming among youth from at-risk environment, it was also hypothesized that students would demonstrate significant reductions in involuntary stress responses (Feagans Gould et al., 2012; Mendelson et al., 2010). Although it was expected that the intervention would impact the individual subscales of involuntary reactions to stress, these analyses were notably more exploratory. Based on theory and the limited previous work in this area, the results for rumination were particularly of interest.

Method

Participants and Procedures

Participants included one hundred and twelve 5th and 6th grade students (51.8% female; mean age = 10.4 years) from three private Catholic schools located in Philadelphia, Pennsylvania. 73 students were in the intervention group and 39 were in the control group. The students in the intervention group were from four different classes - two at school A and two at school B. Three of the four classes were fifth-grade students while the remaining was a sixth-grade class. The 39 students in the control group were from two different fifth grade classes, one at school A and the other at school C. All three schools serve diverse minority student populations (over 90% of students identify as non-white) from low-income neighborhoods; school data indicate that 44%-68% of the families across these schools were classified as below poverty.

Given the non-random assignment of the intervention and control groups, this was a quasi-experimental design study. Students at school A and B received the intervention program as an extra gym class while students at school C and the control group students at school A participated in their regularly scheduled physical education curriculum. Students in both the intervention and control groups did not miss any academic instruction due to participating in this study. Information about this research study was sent home to the parents and guardians of the students in the participating classrooms. Passive parental consent and assent from the students were obtained prior to the administration of the pre and post-test paper-based survey assessments, administered in September and June, respectively. These surveys included basic demographic information and self-report measures of empathy and perspective-taking, involuntary response to stress, and mindfulness. The assessments were administered during the school day and took approximately 15 minutes to complete. All procedures followed a standard protocol as set forth and approved by the University IRB and the school board(s) of the participating schools.

Mindfulness Intervention

Mindfulness through Movement (MTM; https://mindfulnessthroughmovement.org/) is a nonprofit corporation that was cofounded by two yoga instructors in 2013. The program of the same name was established to offer mindfulness and yoga programing to urban youth who attend Philadelphia schools. Given that these students primarily come from underserved areas with chronic stressors, the intent of this program was to provide them with a source of empowerment via mindful and yoga-based practices. Through this program, students learn simple breathing exercises and movement practices that are intended to help them better manage the stressors present in their daily lives, improve their relaxation skills, and be engaged and mentally ready to learn in the classroom. Students participated in programming twice a week for 45 minutes across the school year (October through April).

The Mindfulness through Movement program was facilitated by certified yoga teachers (RYT 200 hours) who have also completed the 15-hour MTM teacher training program developed by Verge Yoga in collaboration with the

Holistic Life Foundation (HLF) Inc. The manual for the MTM program that teachers used contains 16 lessons focused on mindfulness, movement, breath, and relaxation. While the specific content of each class changed weekly based upon the needs of students, there were essential elements included in each class. The main components of the program are represented by the acronym SMILE. "S" represents the work that is done to set the stage for class by creating a safe environment for participants and took 5 to 7 minutes to complete. The focal activity for this section included a brief check-in with the students, asking them how they felt after the last class and if there was anything going on that the instructor should know. "M" is for movement; during this 10 to 15-minute period students engaged in basic yoga poses and sequences. Poses included "Mountain", "Down Dog", and "Forward Fold." "I" stands for inhale and covered the breath work or pranayama of the session which lasted about 5 minutes. The breathing exercises were child-friendly; examples include pretending to blow up a balloon or breathing like a dragon. The mindful meditation component is represented by "L", which stands for "let it be", and took 10 minutes to complete. Here, students were encouraged to engage in familiar activities like eating and listening mindfully. For instance, students were given a piece of fruit and were encouraged to explore it with their senses – looking at it, picking it up, closing their eyes and feeling it, smelling it, and finally biting eat and slowly chewing. During this part of the intervention students were also taught about the brain and individual stress responses. Finally, "E" is for exhale, and represented the cool down or relaxation phase of the session where participants were in savasana or star pose, taking time to reflect on all that transpired during the session and make important connections between their mind and body. For this last 5 minutes of the session, students were often encouraged to place their hands on their heart wishing themselves and others in the room gratitude and kindness.

Measures

Empathy and Perspective-Taking

The Thoughts and Feelings Questionnaire (TFQ) is a compilation of the Empathic Concern and Perspective-Taking subscales of the Interpersonal Reactivity Index (IRI; Davis, 1983). The TFQ was developed specifically to assess individual differences in empathy during middle childhood (Garton & Gringart, 2005). The TQF is a 14-item scale with half of the items assessing empathy and the other perspective-taking skills. Sample empathy items include "I often feel sorry for people who don't have the things I have" and "When I see someone being treated mean, it bothers me." Sample perspective-taking skills items include "Sometimes I try to understand my friends better by imagining how they think about things" and "Even when I know I'm right I listen to what other people think." Students reported how true each item was for them on a Likert-type scale from 1 (not at all like me) to 5 (always like me). The pretest reliabilities for the empathy ($\alpha = 0.81$) and perspective-taking ($\alpha = 0.72$) subscales were high and consistent with those reported in another study using a similar questionnaire with in the late elementary and middle school years (Schonert-Reichl et al., 2012).

Involuntary Responses to Stress

The Involuntary Engagement Scale of the Responses to Stress Questionnaire (RSQ) was used to assess student response to interpersonal stressors (Connor-Smith et al., 2000). As there are different versions of the RSQ, the one used in the present study was designed specifically to measure peer-related stress in children at least 9 years of age. This 15-item scale is comprised of five subscales that assess emotional arousal, physiological arousal, involuntary action, rumination, and intrusive thoughts. Example items from the subscales include "I keep remembering what happened with the other kids or can't stop thinking about what might happen" (intrusive thoughts), "When I have problems with other kids I can't stop thinking about what I did or said" (rumination), "When I have problems with other kids I feel sick to my stomach or get headaches" (physiological arousal), "When problems with other kids come up, I get upset by things that don't usually bother me"(emotional arousal), and "When I have problems with other kids, sometimes I can't control what I do or say" (involuntary action). Students reported how much they felt or did the action described by the item, on a Likert-type scale from 1 (not at all) to 3 (a lot). Although the pretest reliability for the involuntary engagement scale in the current study was good ($\alpha = 0.83$), the subscale alphas were low. Confirmatory factor analysis indicated that the items better loaded onto three subscales rather than the five purported by the measure's developer. The first subscale included the six items on rumination and intrusive thoughts ($\alpha = 0.66$), the second included the six items on emotional and physiological arousal ($\alpha = 0.62$), and the last was comprised of the three involuntary action items ($\alpha = 0.60$). Correlations among the items also supported the above groupings.

Analytic Plan

A series of independent *t*-tests were conducted to examine group differences in empathy, perspective-taking, and involuntary response to stress at pre-and post-test as part of the preliminary analysis process. In addition, the change

Table 1 Between-group differences in empathy, perspective-taking, and involuntary responses to stress

Measure	Intervention group ($n = 73$) M (SD)	Control group ($n = 39$) M (SD)	F	p value	Partial η^2
Empathy (TFQ)					
Pretest (T1)	3.00 (1.03)	3.25 (1.06)			
Post-test (T2)	2.88 (0.98)	3.42 (0.94)	6.38	0.01	0.06
Perspective-taking (TFQ)					
Pretest (T1)	2.30 (0.84)	2.67 (0.88)			
Post-test (T2)	2.30 (0.89)	2.86 (0.97)	4.75	0.03	0.04
Rumination/instructive thoughts (RSQ)					
Pretest (T1)	1.54 (0.40)	1.63 (0.43)			
Post-test (T2)	1.59 (0.38)	1.81 (0.46)	5.62	0.02	0.05
Emotional/physiological arousal (RSQ)					
Pretest (T1)	1.76 (0.47)	1.70 (0.40)			
Post-test (T2)	1.68 (0.40)	1.78 (0.48)	2.39	0.13	0.02
Involuntary action (RSQ)					
Pretest (T1)	1.90 (0.54)	1.80 (0.57)			
Post-test (T2)	2.01 (0.59)	1.81 (0.55)	2.22	0.14	0.02

Note. The F statistic represents the effect of group variable at post-test using estimated marginal means
TFQ Thoughts and Feelings Questionnaire, *RSQ* Response to Stress Questionnaire

within each of the groups over time was examined via paired samples t-tests. The effects of the program were explored via multiple ANCOVAs with intervention status and pretest scores as covariates. The partial eta-squared statistic was used as an estimate of effect size, with $\eta^2 = 0.02$ suggesting a small effect, $\eta^2 = 0.09$ signifying a moderate effect, and $\eta^2 = 0.25$ representing a large effect (Cohen, 1988).

Results

The means and standard deviations of the study variables at pretest (T1) and posttest (T2) are displayed in Table 1. Given that there were no significant differences between the three schools at T1, students were combined across schools for analyses. Independent t-test results indicated few differences in scores between the intervention and control groups at T1; the only significant difference between the groups was in perspective-taking, $t(39) = 2.23$, $p < 0.05$, with students in the control group reporting higher scores. At T2, significant differences were found for perspective-taking, $t(39) = 3.08$, $p < 0.01$ and empathy, $t(39) = 2.80$, $p < 0.01$, with the control group demonstrating the advantage. There was also a significant difference for the combined rumination & intrusive thoughts subscale at T2, $t(39) = 2.64$, $p < 0.01$, with intervention students demonstrating lower levels than their peers.

The extent to which the change from pre- to post-test differed across the two groups over time was examined using a series of ANCOVAs with pretest score and group status (intervention or control) as covariates (see Table 1). The results indicated that group status was significant for empathy, $F(1,109) = 6.40$, $p < 0.01$, partial $\eta 2 = 0.06$, with the control group demonstrating a higher estimated marginal mean at T2. Thus, while the within-group change for both groups was not significant according to the follow-up paired samples t-tests, control, $t(39) = 1.23$, ns, and intervention, $t(73) = 2.80$, ns, it appears that the change within each group was enough to increase the difference between the groups at T2. Group status was also significant for perspective-taking, $F(1,109) = 4.75$, $p < 0.05$, partial $\eta 2 = 0.04$, such that students in the control group experienced a significant increase in their perspective-taking skills, $t(39) = 2.23$, $p < 0.05$, while students in the intervention group did not change, $t(73) = 3.1$, $p < 0.01$. Of the three involuntary stress response subscales, group status was only significant for the rumination and intrusive thoughts subscale, $F(1,109) = 5.62$, $p < 0.05$, partial $\eta 2 = 0.05$. The results of follow-up paired samples t-test show that that students in the intervention group remained constant, $t(73) = 1.12$, ns, while those in the control group experienced a significant increase in their rumination and intrusive thoughts, $t(39) = 2.64$, $p < 0.01$. Although a similar trend was found for the physiological and

emotional arousal subscale, the pattern did not reach significance.

Discussion

Results from this study indicate that the Mindfulness through Movement Program may protect against increased involuntary reactions in response to peer-related stress. Particularly, students in the program reported lower levels of rumination/intrusive thoughts and physiological/emotional arousal, although the difference was only significant for the former subscale. Thus, participation in the Mindfulness through Movement Program appears to have been protected against an increase in negative cognitive processing. Contrary to our expectations, empathic awareness and perspective-taking remained stable among intervention students, while students in the control group reported increased levels over time. Although this pattern was not hypothesized, the stable scores could reflect an increased self-awareness among students in the intervention group, similar to how decreased mindfulness has been reported among youth after their participation in mindfulness-based intervention (Johnson et al., 2017). Thus, it is possible that youth who participated in the intervention were better able to recognize their behaviors because of the increased awareness and acceptance of their internal cognitive states that was cultivated through the mindfulness practices (Cook-Cottone, 2017).

Much like previous studies that have reported decreases in maladaptive stress responses as a result of participating in a school-based mindfulness programming (Feagans Gould et al., 2012; Mendelson et al. 2010), intervention participants in the current study experienced a significant decrease in their levels of rumination and intrusive thoughts. While the reported decrease in arousal only approached significance, the noted decline is consistent with the research on other school-based mindfulness program where studies report improved stress responses among youth (Kallapiran et al., 2015; Mendelson et al., 2010; Pepping et al., 2016; Tan & Martin, 2013). The lack of significance likely reflects one of the many measurement challenges in the contemplative field (Van Dam et al., 2018). Specifically, there have been criticisms of the use of self-report for psychological constructs, like mindfulness, that may be vulnerable to demand characteristics and differences in item interpretation across various groups. Indeed, research finds that mindfulness measures show different factor structures between meditators and nonmeditators (Van Dam et al., 2009), and before and after mindfulness training (Gu et al., 2016). If this possibility is extended to other phenomena that include meta-awareness, like rumination, students in the intervention may have interpreted these items differently than their peers who did not engage in practices that focused on noticing and reflecting on their thoughts, physical sensations, and emotions. This explanation is consistent with the one proposed by Grossman and Van Dam (2011) used to interpret a study that found higher levels of mindfulness among college binge drinkers than among experienced meditators (Leigh et al., 2005).

While the intervention did not promote empathy and perspective-taking among the youth in the intervention group, the discussions that took place throughout the program may have allowed participants to become more aware of the actual state of their ability to have empathy for and take on the perspective of others. Similar to how individuals who participate in mindfulness-based programs may report decreases in mindfulness after participation (Johnson et al., 2017), participation in the Mindfulness Through Movement program may have led to a change in the participants perception of their empathic concern and perspective-taking abilities. Given that changes in higher order empathy, or the ability to engage in the more cognitive-based components of empathy like being able to make sense of the thoughts and feelings of others, emerges between the ages of 7 and 9 (Woolrych et al., 2020), it is possible that the program allowed the participants to view their behavior more accurately since the skills should have already begun to surface by this point in time. Alternatively, the lack of change in the intervention group could be due to the measure's inability to tap changes in empathy and perspective-taking as they were discussed throughout the program. Furthermore, given the disproportionate sizes of the intervention and control groups, and the increases seen in empathic concern and perspective-taking in the control group, additional research with a larger sample size of parochial school students is needed to better parse through the differences.

As preadolescents, the participants in this study were in what is considered a developmental sweet spot, where there are neurological shifts occurring in the areas underlining self-regulation targeted by mindfulness-based yoga programming that underscore empathy and perspective-taking abilities (Kaunhoven & Dorjee, 2017). Thus, the results also indicate a need for more developmentally appropriate measures to capture more robust significant differences in these constructs. The TFQ, which as reported above is based on the IRI and originally designed for use with younger participants (Garton & Gringart, 2005), may not have been able to accurately assess changes in the participants as they were slightly older than the participants in the study used to develop the TFQ. Similarly, in their study, Schonert-Reichl and colleagues (2012) used the empathic concern and perspective-taking subscales of the IRI, which has been primarily used with adolescents and adults (Zhou et al., 2003), to assess changes in the constructs in a population with a similar mean age of the participants in the

current study. Unlike their hypothesized outcome, significant positive changes were not found in either construct which is consistent with the findings of the present study.

Additional research with more recently developed measures of these constructs, such as the Adolescent Measure of Empathy and Sympathy (AMES; Vossen et al., 2015) and the Empathy Questionnaire for Children and Adolescents (EmQue-CA; Overgaauw et al., 2017), may help clarify whether the resulting impacts were a result of measurement issues or indicative of the focus of the programming. The EmQue-CA, in particular, may be more appropriate for participants in similar ages to those in the present study who boarder the line between middle childhood and adolescence as it was developed for those 10 and up (Overgaauw et al., 2017). The inclusion of different measures that use developmentally appropriate language like the EmQue-CA may also better capture growth in these areas, particularly given that they were created to be valid across childhood and into adolescence.

Although this study provides us with an increased understanding of the links between mindfulness-based programming, empathy, perspective-taking and responses to stress, there are several notable limitations. One of the most pressing issues is the fact that the study was quasi-experimental in design rather than the more idealized randomized control design (Hariton & Locascio, 2018). Given the reluctance of school administrations to have classrooms serve as control groups and receive no intervention, which has been a long-standing issue in school-based intervention and prevention research (Biglan et al., 2003; Greenberg, 2010), it was not possible to obtain both intervention and control groups at each of the schools included in the sample. Thus, the sample included participants from six different classrooms in three different schools, which may have been a contributing factor to the limited findings. Specifically, although the schools were similar in terms of catchment areas and student demographics, there may have been important school and/or classroom variables that differed across the students which quasi-experimentally designed studies may overlook (Jaycox et al., 2006). Unfortunately, the small sample size and uneven split between the experimental and control groups, prevented us from utilizing more rigorous analyses that would have allowed us to examine potential school- and classroom-specific differences.

Another limitation of this study was the reliance on self-report measures, which are controversial within the mindfulness-based literature due to the before mentioned issues (Van Dam et al., 2018). Indeed, it has been found that the use of self-report measures in mindfulness-based intervention studies may indirectly confound results as participants were aware that they were involved in programming that was "supposed" to impact their behaviors (Davidson & Kasniak, 2015). Moreover, in general, self-report measures are also often criticized in evaluation studies because they only represent a one-sided examination of program impact (Dariotis et al., 2015). There is also the risk of measurement error which can lead to questions surrounding the reliability and validity of the intervention(s) (Felver et al., 2016; Lyons & DeLange, 2016). Still, most studies on mindfulness-based interventions in school settings utilize student-self report over and above other informants (Felver et al., 2016).

Ideally, program evaluations would include objective measures of the outcomes across multiple informants, such as classroom teachers, parents, or independent observers. In a systematic review of 28 studies on mindfulness-based interventions in schools, 9 included teacher reports and only 4 included reports from parents (Felver et al., 2016). For example, a quasi-experimental study conducted by Schonert-Reichl and Lawlor (2010) utilized teacher behavioral ratings and found that students in the intervention group improved significantly in their attentiveness, emotional regulation, and social and emotional competence in comparison to the control group. Similarly, other studies have demonstrated the credibility of parent reports in capturing student behavioral changes related to mindfulness-based interventions. The results of these study indicate that parents have also been able to report significant changes across a variety of variables ranging from executive functioning and hyperactive behavior to stress and well-being (Carboni et al., 2013; Flook et al., 2010; Van de Weijer-Bergsma et al., 2014).

The current study was also limited in terms of the scope of the outcome variables. Ideally, future studies would benefit from examining the impact of the intervention on critical school outcomes associated with academic achievement, school engagement, and mental health, such as grades, test scores, attendance, and mental health referrals (Bennet & Dorjee, 2015; Carsley et al., 2017; Felver et al., 2016). There is also a critical need for physiological measures of stress and wellbeing (Felver et al., 2016). Blood pressure, heart rate, heart rate variability, skin conductance, and salivary cortisol are a few of the assessment methods used with adults to evaluate the effect of yoga on psychophysiological responses to stress (Fishbein et al., 2015). Although some of these methods have been explored with children and adolescents (Fishbein et al., 2015; Hagins et al., 2013; McKeering & Hwang, 2019), results are limited and require replication. A final limitation is the lack of formal fidelity observations that could have indicated the extent to which the Mindfulness through Movement Program curriculum was strictly adhered to in each of the intervention classrooms. Fidelity of program implementation, especially regarding school-based mindfulness interventions, is critical to support the validity and value of such programming (Emerson et al., 2020; Feagans Gould et al., 2015).

Overall, this study suggests that participation in a school-based mindful yoga program may prevent youth from experiencing increases in their negative cognitive processing and support self-awareness of social emotional functioning. The current study is also unique in that the mindfulness program was infused into the children's classroom across the year, rather than many other programs that are typically 8-12 weeks in length. Benefits of this year-long approach include consistent and sustained practice, which are critical to program effectiveness (Huppert & Johnson, 2010), and the opportunity for the facilitator to establish a more personal connection with the children and teacher. In addition, this model may enhance the acceptability of the practices by both students and teachers, as the mindful yoga may be viewed as integral to the classroom rather than considered an "add-on" to the curriculum. Future studies should examine the extent to which students continue their practice as they transition to the next grade as well as any sustained benefits of the intervention. As universal mindfulness programs expand in schools, it is also important to identify student characteristics that may impact the effectiveness of the intervention. For example, programs may assess the moderating impact of initial mindfulness as it could lead to the tailoring of mindfulness practices, perhaps altering the sequence or focus of exercises, to increase impact for all children.

While the current study demonstrates that secular mindfulness programming can be successful within parochial schools, the results may also inform recent efforts to promote spirituality across K-12 education, such as those supported by the Collaborative for Spirituality in Education. Spirituality, which refers to the human capacity to find meaning in our lives and to make connections with others that acknowledge our common humanity and our belonging to something greater than ourselves (Benson et al., 2003), is a key construct associated with positive youth development (Schoonmaker, 2009; Shek, 2012). Although the natural intersection of mindfulness and spirituality within education have been addressed in multiple reviews (Cobb et al., 2016; Roeser et al., 2008), empirical research is needed to identify opportunities to integrate mindfulness-based practices within classroom- and school-based curriculum that seek to promote spirituality in secular education.

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Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of Syracuse University and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Approval for this study was obtained from the Syracuse University Internal Review Board.

Informed Consent Informed consent was obtained from all individual participants included in the study. Parental consent included both active and passive consent. All children provided verbal assent to participate.

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