Mindfulness in Schools:

Evidence on the Impacts of School-Based Mindfulness Programs on Student Outcomes in P–12 Educational Settings

PennState College of Health and Human Development

EDNA BENNETT PIERCE PREVENTION RESEARCH CENTER

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This issue brief, created by The Pennsylvania State University, is one of a series of briefs that addresses the future needs and challenges for research, practice, and policy on social and emotional learning (SEL). SEL is defined as the process through which children and adults acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions. This is the second series of briefs that address SEL, made possible through support from the Robert Wood Johnson Foundation. The first set synthesized current SEL research on early support for parent engagement and its effects on child outcomes; SEL in infancy/toddlerhood, the preschool years, the elementary school period, and middle-high school timeframes; and how SEL influences teacher well-being, health equity, and school climate. Learn more at: www.prevention.psu.edu/sel

Executive Summary

The number of school-based mindfulness programs (SBMPs) for students has been increasing over the last fifteen years. They've been developed for students from pre-kindergarten through high school (P–12 settings). While the reach of SBMPs is substantial, their introduction has outpaced research on their effectiveness across diverse sociocultural contexts and school environments, and with students of different ages and backgrounds. A look at studies conducted between 2000 and 2019 showed that SBMPs improve students' mindfulness and self-regulation skills. Further, there is promising evidence that these programs reduce students' feelings of anxiety and depression, support their physical health, and assist them in engaging in healthy relationships with others. However, there is little consistent evidence at this time that SBMPs reduce students' anger and aggression or improve their well-being, and further study is needed to adequately assess program impacts on students' school behavior and performance. In the coming years, more scientific research on SBMPs is needed to determine: which kinds of practices and program elements work best, what outcomes they influence, and which students are impacted the most. Recommendations for practitioners considering the use of SBMPs are offered.

Introduction

School-based mindfulness programs (SBMPs) for students have been proliferating over the past fifteen years. They've been developed for students across the education spectrum, from pre-kindergarten to high school. Their reach is substantial, with some claiming to have served over one million youth (see www.mindfulschools.org). The appeal of mindfulness programming for students has co-evolved with the SEL movement and its emphasis on cultivating students' social-emotional skills alongside their academic learning.[1] The dozens of school-based mindfulness programs that have been developed and implemented across the world have been designed to teach students how to pay attention, regulate stress, feel better emotionally, engage in healthy relationships, and perhaps, even do better in school. As the number of programs has increased, so too have the number of research evaluations of their impacts on students.[2]

In this brief, we look at what is currently known about the impacts of school-based mindfulness programs on student outcomes. Based on scientific criteria, we selected the 54 most rigorous evaluation studies of SBMPs to date.[I] These 54 studies, representing over 13,000 students, evaluated the impacts of 36 different SBMPs for students in pre-kindergarten, elementary school and secondary school settings (P–12 grades).

In undertaking our review of these studies, we asked a series of questions. Does the existing evidence suggest that SBMPs help students to become more focused and better able to cope with stress? Are students who participate in SBMPs less distressed and happier? Are they physically healthier and more socially connected? Are SBMPs associated with increased school engagement and performance? Using data from these 54 studies, we answer these questions in a way that we hope is informative for educators, school leaders, and policy makers who are considering implementing SBMPs.

The brief consists of four parts: (1) a definition of mindfulness; (2) a logic model that depicts hypothesized impacts of SBMPs on student outcomes; (3) a summation of evidence regarding the impacts of SBMPs on student outcomes; and based on our scientific review, (4) a set of guiding practical questions for practitioners to consider before implementing SBMPs with their students.

Defining Mindfulness

While there are different definitions of mindfulness, we define mindfulness in this brief as (1) a *natural mental state*, and also (2) an *educable skill* that, with sustained practice, can become (3) an *enduring mental trait*.

As a *natural mental state*, mindfulness has been described as paying attention in a particular way "on purpose, in the present moment, and nonjudgmentally".[3] Mindfulness has two interrelated dimensions: (1) the self-regulation of attention and (2) a balanced mental attitude. Attention is the conscious monitoring of ongoing subjective experience, without distraction or forgetfulness. A balanced mental attitude involves taking a curious, open-minded, and nonreactive orientation toward experiences that naturally arise during daily living.[4]

Mindfulness is also considered to be an *educable skill*, which, to be developed, requires consistent engagement with mindfulness practices over and over again.[II] Studies show that adults who engage in mindfulness practices gradually learn and develop mindfulness-related skills.[III] These skills, in turn, can help to reduce stress and distress, and improve well-being, physical health, social relationships, and the performance of daily life tasks.[IV] In sum, with education and repeated practice, mindfulness can develop from an intermittent natural mental state to a relatively *enduring mental trait*.

Describing Mindfulness Practices in SBMPs

In order to transform mindfulness from a natural state to a trait, engaging in various kinds of mindfulness practices and exercises that train attention, curiosity, and non-reactivity is essential. The programs we reviewed included a wide variety of mindfulness practices (see Appendix: Supplementary Table 1 for fuller description). These practices, by and large, aimed to cultivate mindfulness through curious, non-judgmental attention to (a) the senses (e.g., mindfulness of tastes, sights, sounds), (b) the body as a whole (e.g., body scans) and (c) the breath (e.g., mindfulness of natural breath). To a lesser extent, mindfulness was cultivated through practices that focused on mindfulness of (d) feelings and (e) thoughts. Applications of mindfulness to daily life tasks (e.g., eating, consumption behavior, awareness of surroundings and others) were also present in many programs.

Defining the Student Outcomes of SBMPs

In order to summarize program impacts from the 54 studies reviewed, we coded the student outcomes examined into five main outcome categories: (1) Mindfulness and Self-Regulation Skills, (2) Mental Health, (3) Physical Health, (4) Healthy Relationships with Others, and (5) School Behavior and Performance. These outcomes are described more fully in Table 1.

TABLE 1

Student Outcomes Evaluated and Categorized in the Reviewed Research Studies

Mindfulness & Self-Regulation Skills

- **Mindfulness Skills:** Mindfulness of sensation, emotion and thought; self-compassion
- **Attention Regulation:** Selective attention; attentional switching; working memory; self-control; inhibitory control
- **Emotional Regulation:** Emotional awareness and processing; impulse control; improved cognitive reappraisal; emotional expression; positive coping; coping self-efficacy

Mental Health

- **Internalizing Distress:** Stress, symptoms of anxiety and depression; negative affect; test anxiety; rumination; reactive responses to stress; somatic complaints; negative coping
- **Externalizing Distress:** Impulsivity; hyperactivity and social problems; anger; anger expression/aggression; hostility; attention problems
- **Psychological Well-Being:** Positive affect; resilience; optimism; positive self-concept

Physical Health

- **Physiological Indicators:** Blood pressure; heart rate; cortisol output (stress hormones); body mass index
- **Behavioral Indicators:** Sleep; mindful eating; health care utilization; intention to use substances and abstention from alcohol use; positive and negative alcohol expectancies; drinking refusal self-efficacy; dietary restraint

Healthy Relationships with Others and the Physical World

- **Prosocial Skills and Altruism:** Social skills; social-emotional competence; empathy; kindness, compassion for others, diminished affective prejudice and stereotyping
- **Positive Connections to Others:** Cooperation, popularity; positive peer and teacher relations; positive social climate
- **Positive Connections with Nature:** Connection with nature and others; sustainable consumption behavior

School Behavior and Performance

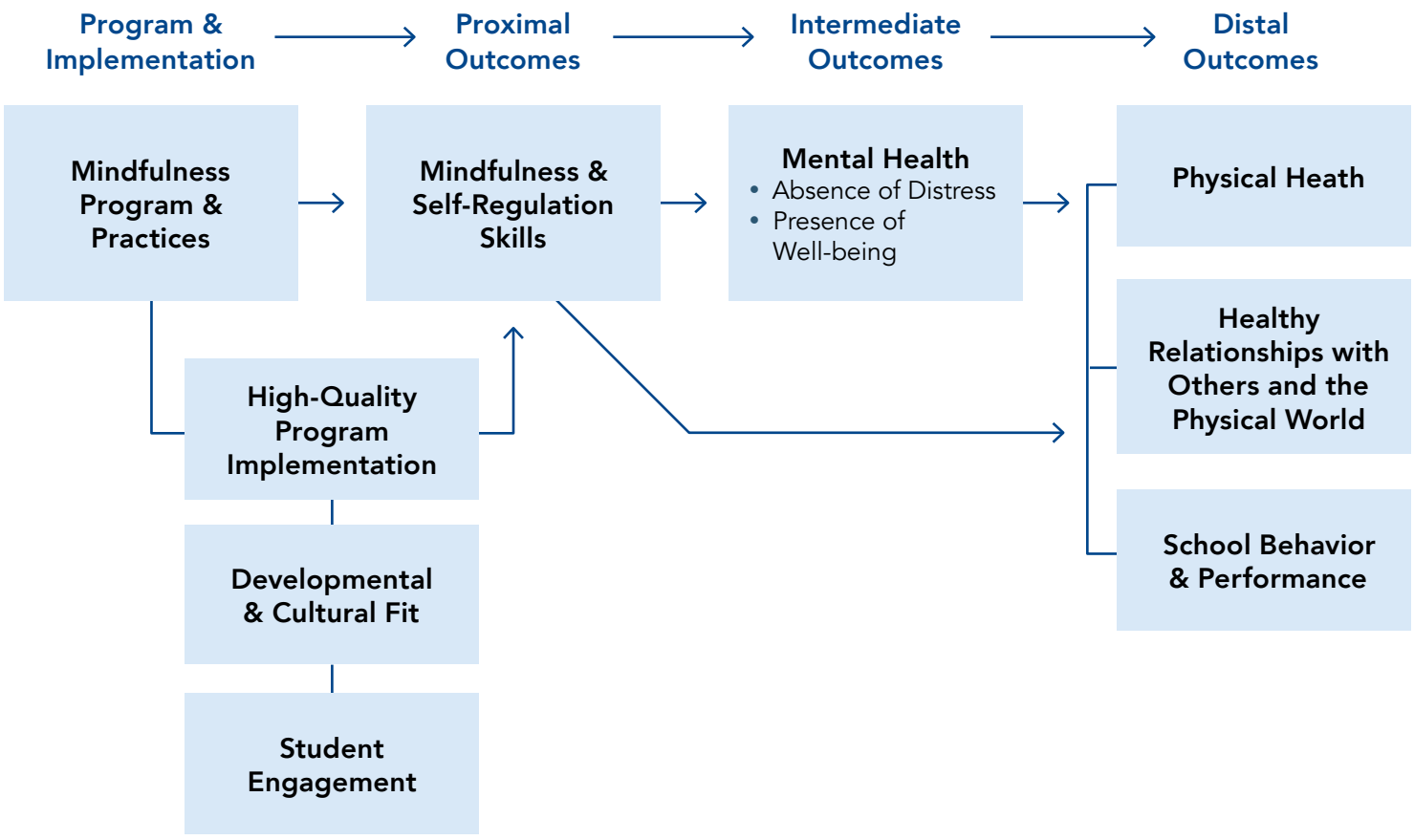
- **Academic Motivation:** Academic self-concept, motivation to learn
- **Academic Behaviors:** Classroom engagement, rule-following, lack of disruptive behavior
- **Academic Performance:** Grades, academic skills

We also developed a theory of change for how SBMPs might affect these outcomes over time based on wider work in the field (see Figure 1). Briefly, our theory of change hypothesizes that program impacts on students are a function first and foremost of (a) high-quality program implementation and (b) a good "fit" between the program and practices and the cultural and developmental needs and capacities of students, educators, and the school community. Programs that provide a good "fit" may foster teacher and student engagement with the program and practices. Student engagement may lead to the development of mindfulness and self-regulation skills. These skills, in turn, may help students manage emotions, reduce stress and distress, and improve feelings of well-being.

Finally, mindfulness and self-regulation skills, as well as improved mental health, may lead to improved physical health, relationships with others, and school success. In sum, the potential value of SBMPs is in strengthening students' mindfulness and self-regulatory skills—skills that are key underlying processes in students' mental health, physical health, relationships with others, and academic learning.[v]

FIGURE 1

Logic Model: Impacts of School-Based Mindfulness Programs for Students



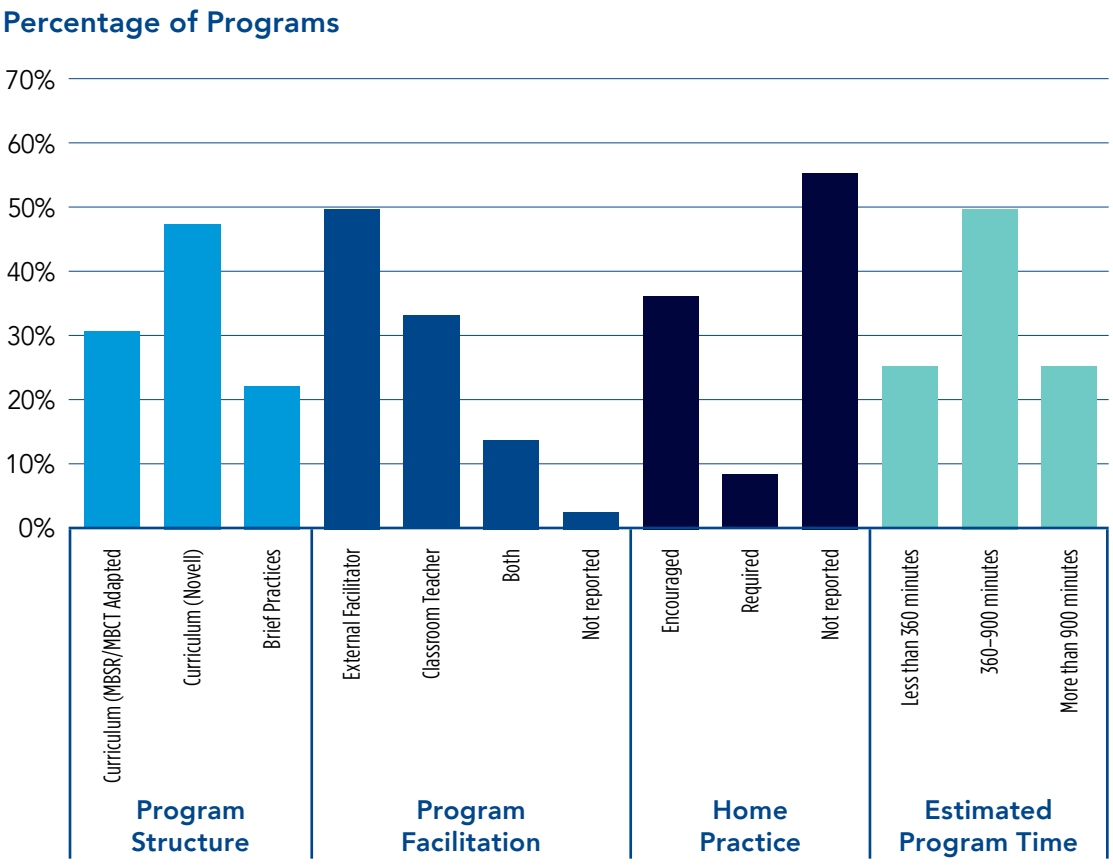
A Look at the Mindfulness Programs and Research Studies Reviewed for This Brief

Description of Programs

Before looking at overall program impacts, we examined a few key characteristics of the 36 SBMPs that were evaluated in the 54 scientific studies we reviewed (some programs were evaluated in multiple scientific studies). All of the programs studied were delivered during the school day. SBMP characteristics included program structure, facilitation, home practice or homework components, and total in-class program / practice time. We broke down the description of these program characteristics in relation to whether the program was delivered in pre-kindergarten, elementary school (K-8), and secondary school settings (grades 9–12). These program characteristics by school level are presented in Figure 2.

FIGURE 2

Characteristics of School-Based Mindfulness Programs in Review



Notes: Novel curricular programs were those designed specifically for children or adolescents. Adapted curricular programs were developed from existing adult Mindfulness-Based Stress Reduction or Mindfulness-Based Cognitive Therapy programs and practices. Those programs characterized as having a structure of 'brief practices' were those that involved practices designed for and administered to students, lasting no more than 20 minutes at a time. When coding for facilitation, programs were coded as both if studies of the program reported different facilitation approaches or if the program administration involved both classroom teachers and external facilitators.

Description of Research Studies, Samples and Schools

In addition to program characteristics, it is important to note a few characteristics of the studies, students, and schools included in the brief. All studies included an explicit mindfulness component, were published in peer-reviewed scientific journals, and used experimental designs that included a randomized or matched-comparison group of students against which to assess program impacts. Applying these inclusion criteria, we identified 54 studies. These studies represented over 13,000 students in P–12 educational settings. We organized these studies into three age groupings: (1) studies done with pre-kindergarten students (**PreK**: 6 studies, 11% of total studies), (2) those done with kindergarten through 8th grade students (**Elementary**: 30 studies, 56% of studies), and (3) those done with 9th to 12th grade students (**Secondary**: 18 studies, 33% of studies).[VI] These characteristics help us to understand "to whom do the impacts summarized in this review apply"?

We found that 65% of the studies of SBMPs we reviewed included students exclusively from public schools[VII], 35% included a majority of students from low-income backgrounds[VIII], a third (33%) included a majority of minority students in the study and 89% evaluated a universal SBMP, rather than a targeted program designed for students who met specific criteria. In sum, these studies were conducted with primarily public school students, with some racial/ethnic, immigration, and socioeconomic diversity, who received a universal SBMP aimed at changing one or more of the student outcomes shown in Table 1 and Figure 1.

Outcomes from SBMP Participation

What did we learn about SBMP impacts on student outcomes in these studies? Figure 3 depicts the number of studies assessing each major student outcome[IX]. As the light blue bars in this figure show, and as discussed earlier in relation to our theory of change (Figure 1), the most frequently evaluated student outcomes were Mindfulness and Self-Regulation, followed by Mental Health and then Physical Health, Healthy Relationships, School Behavior and Performance. The dark blue bars in Figure 3 represent the number of studies that evaluated a student outcome and also showed a program impact on that outcome.

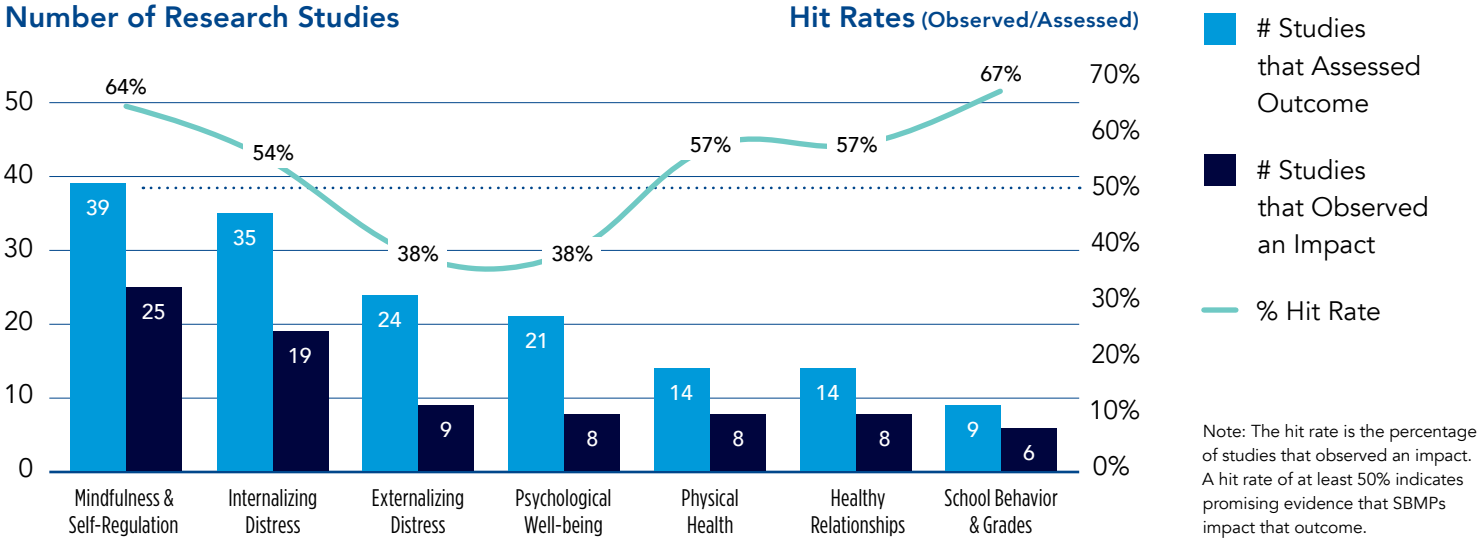
To assess overall program impacts on each student outcome, we used the light and dark blue bars to calculate a "hit rate"—the number of studies showing a significant program impact on a particular outcome (compared to the control group) divided by the total number of studies that assessed that particular outcome.[X] The higher the hit rate, the greater our confidence in consistent findings across studies looking at a particular student outcome.

For purposes of this brief, if a "hit rate" on a particular student outcome is 50% or less, then we conclude that current research shows a low likelihood that SMBPs impact that outcome. If the hit rate is above 50%, then we conclude there is evidence of (potentially significant) promise of SBMPs on that outcome. Figure 3 presents hit rates for student outcomes assessed across all studies (depicted as a curved line running across the top of the figure); and Figure 4 presents hit rates as bars for each student outcome split by age/educational setting (PreK, Elementary, Secondary).

These hit rates for each student outcome and by age/educational setting led us to five main conclusions.

FIGURE 3

Number of Reviewed Research Studies Evaluating and Showing an Impact on 7 Student Outcomes



Note: The hit rate is the percentage of studies that observed an impact. A hit rate of at least 50% indicates promising evidence that SBMPs impact that outcome.

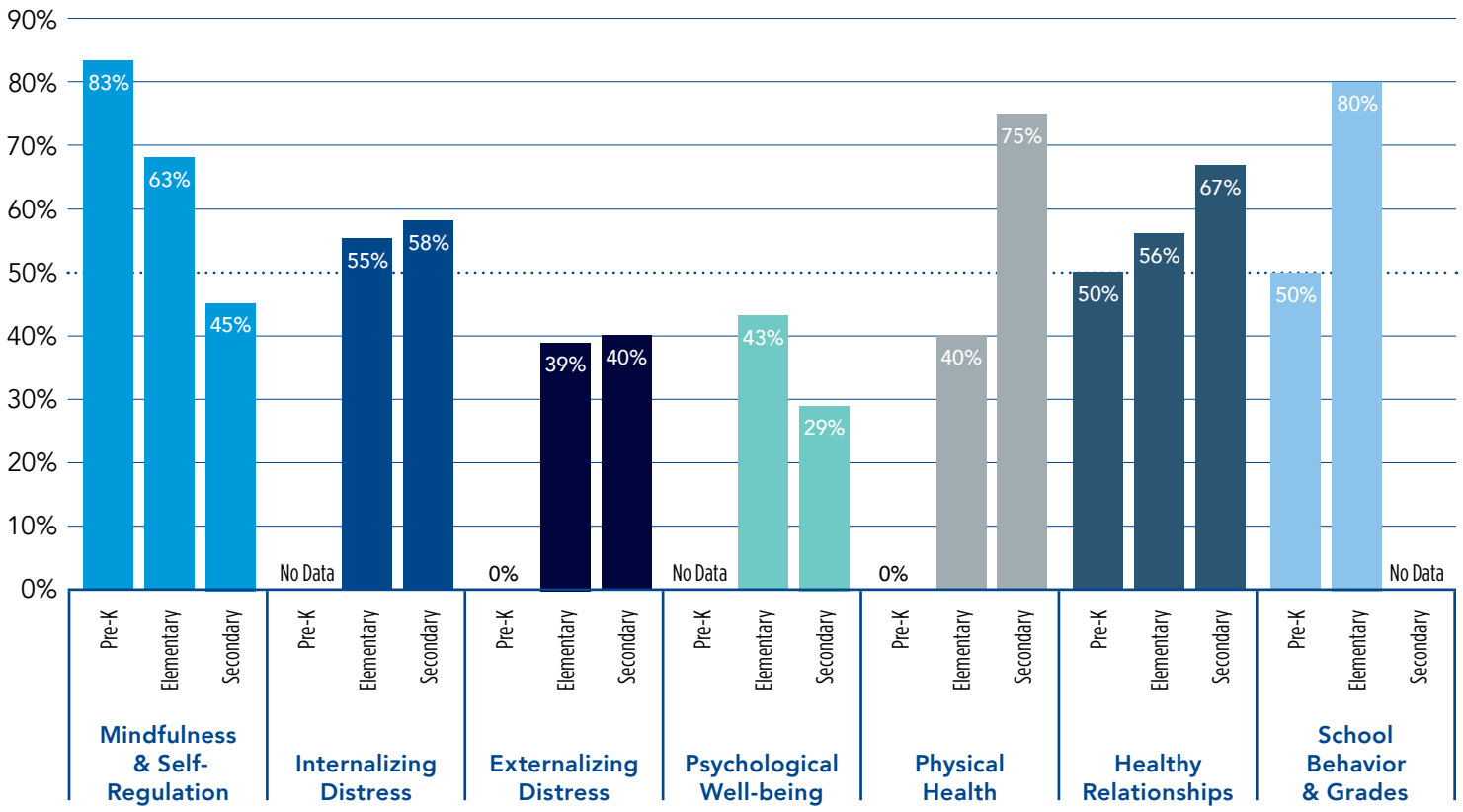
Conclusion 1. Mindfulness Programs Improve Students' Mindfulness and Self-Regulatory Skills

Mindfulness programs have a positive and significant impact[XI] on students' mindfulness and self-regulatory skills in the pre-kindergarten and elementary (K–8) grades (see Figure 4).

The majority of the studies reviewed shared evidence of significant SBM program impact. For instance, Quach, Mano, and Alexander[8] randomly divided 200 7th to 9th graders into one of three groups: a mindfulness group, a yoga group, or a wait-list control group.[XII] Results showed that those in the mindfulness group outperformed those in the yoga and control groups on a behavioral task requiring focused attention and memory. Other studies involving PreK[9,10] elementary students[11–14] and secondary school[15,16] students found improved mindfulness skills following training.

FIGURE 4

Impacts (Hit Rates) on 7 Student Outcomes by Age/Educational Setting



Conclusion 2. Mindfulness Programs Can Reduce Students' Internalized Distress

The second outcome receiving the most attention was students' internalized distress (e.g., stress, symptoms of anxiety and depression). Of the 35 studies that examined this outcome in elementary and secondary school students, 19 (54%) showed positive results, indicating promising evidence that SBMPs reduce elementary and secondary school students' internalizing distress. As an example, one study of 300 5th through 8th graders in a socioeconomically disadvantaged urban public school found that those who underwent a mindfulness program reported significantly fewer depressive and post-traumatic symptoms, as well as lower somatization, rumination, negative affect, and negative coping than those in the control group.[17] Other studies of adolescents also have found reductions in depressive symptoms that have lasted up to 2 weeks,[18] 3 months,[19] 4 months,[20] and even 6 months.[21] Not all studies we reviewed found reductions in students' internalizing distress, however. For instance, a study of the 9-week ".b" program with students from a mix of private and public Australian middle schools found no effects on depression, anxiety, or weight and shape concerns, 6 or 12 months after the program.[22,23] More research is needed to ascertain for whom, when and why universal SBMPs reduce internalized distress among elementary and secondary school students.

Conclusion 3. There is Little Evidence that Mindfulness Programs Reduce Students' Externalizing Distress or Improve Students' Well-being

The next most examined outcomes were students' externalizing distress (e.g., anger, aggression, impulsivity) and well-being (e.g., positive emotions, optimism[XIII]), respectively.[XIV] There is little evidence for the impact of SBMPs on these outcomes in our review.[XV] Overall, with regard to all dimensions of students' mental health, it seems SBMPs show promise for reducing internalized distress, but there is little to no consistent evidence that they reduce externalizing distress or improve well-being in students at this time.

Conclusion 4. There is Promising Evidence that Mindfulness Programs Improve Students' Physical Health and Support Healthy Relationships

Although fewer studies have focused on students' physical health[XVI] and healthy relationships with others and the physical world,[XVII, XVIII] there is evidence of promise of SBMPs' impact on these outcomes. For instance, three studies on physical health showed that African-Americans who received mindfulness training in the form of brief daily practices experienced greater reductions in blood pressure and daytime heart rate in contrast to students in control groups.[24–26] For healthy relationships, the evidence[XIX] also suggested significant promise for SBMPs. For example, a study of 4th- and 5th-graders from urban elementary schools in Western Canada found that students who participated in the MindUP program demonstrated greater increases in self-reported empathy, perspective taking, and optimism. They were also rated higher than their peers in the control group on measures of prosociality and popularity and

were rated as less aggressive.[11] That said, an adaptation of the MindUP program with pre-kindergarteners found no effects on prosocial behavior,[27] nor did an adapted version of MBCT with elementary school students.[28] A study of the Call-to-Care program with urban Israeli elementary students showed reductions in affective prejudice, negative stereotyping about the Israeli-Palestinian outgroup, and improved readiness to engage with them and these effects were maintained at 6-month-followup.[29] More research is needed to better understand the impacts of SBMPs on healthy relationship outcomes, but the evidence to date is promising.

Conclusion 5. There is Only Limited Evidence that Mindfulness Programs Improve Students' School Behavior and Performance

Although the least studied outcome, students' school behavior and performance, showed a high hit rate (67%)—suggesting program impacts on these outcomes. Interestingly, there were no studies of these school outcomes at the secondary school level. Two of four studies with PreK students, and 4 of 5 studies with elementary students showed positive program impacts on school outcomes. However, our review also showed that the majority of these positive impacts were found in programs delivered by classroom teachers[XX]—the teachers who delivered these programs in their classrooms were also the ones who assigned behavior ratings and grades to the students.[XXI] Therefore, although there is some evidence that mindfulness programs are associated with PreK and elementary school students' school behavior and performance, we believe more studies are needed to clarify these findings. These future studies should include objectively measured school outcomes made by evaluators who do not know to which condition students have been assigned (mindfulness or control), to more clearly determine the impacts of SBMPs on students' school behavior and performance.

Recommendations

In summary, our review yielded some specific findings regarding SBMPs' impacts on students. What we found was promising evidence that SBMPs can positively impact students' mindfulness and self-regulation skills, reduce students' internalizing distress, and improve students' physical health and healthy relationships. We found little evidence at this time to support the idea that SBMPs reduce students' externalizing distress or increase their well-being. We also noted that more research is needed on program impacts related to students' school behavior and performance.

The scientific evaluation of SBMPs is still relatively new, and the number of research studies remains somewhat limited in size and quality. Moreover, due to the considerable variation in program characteristics and the diversity in schools and student populations studied, drawing firm conclusions about the best type of program is currently beyond our reach. We still know relatively little about which kinds of programs and practices, for which kinds of outcomes, for which students, at which ages, work best.[30]

Given this tentative evidence, decisions by educational practitioners to implement SBMPs for students might be best made in the context of four main considerations.

First, practitioners might consider what their aims are for choosing a SBMP: what are the intended outcomes, is there any evidence that mindfulness might impact these outcomes, and why choose mindfulness-based programs above other methods to achieve the same end?

Given the state of the science at this time, educators might consider whether alternative evidence-based programs might accomplish the same aims. For example, are other evidence-based programs (e.g., SEL programming) available?

Second, practitioners might consider the diversity in program characteristics in their decision-making.

Key characteristics for educators to consider include the type of program and practices (new, adapted, brief) and fit with student and school needs (e.g., cultural relevance, age appropriateness, parental acceptability, alignment with school culture), type of facilitator needed to deliver the curriculum in a high quality way (external, teacher, or both), home practice requirements of the program (and how to insure equity and inclusivity in such requirements), and overall class time required during the school year (brief, average, long).[XXII] In addition, leaders might ask how SBMPs can be integrated with other programmatic efforts aimed at SEL, equity, and inclusion.[XXIII]

Third, practitioners might also consider their school's readiness and ability to implement the program. What supports are needed by leadership and by school teachers and staff to implement the program in a high-quality way to sustain its use?

Although we focused here on studies of SBMPs often implemented as "stand-alone programs," the lessons of the SEL movement clearly point to the concurrent need for professional development for educators who will implement the programs and practices, and for thinking about how to create a mindful and caring school environment in which such programs could be naturally integrated.[31,32] For example, mindfulness training for teachers has shown evidence of being effective for reducing stress, improving well-being, and perhaps even improving teaching practices in the classroom.[33] Thus, mindfulness programs for teachers may form an important part of any plan to implement student mindfulness programs in a school.

Fourth, the implementing team may wish to assess the intended outcomes to see if the program has equitable outcomes and is intentionally inclusive in its consideration of students, educators, and the school as a whole.

To do so, practitioners might undertake efforts to incorporate assessments of program impacts on students using available data (i.e., school climate surveys, office referrals, attendance metrics), as well as measures to assess program implementation, feasibility, cost, and acceptability (e.g., simple student or staff surveys). School-university partnerships with university faculty interested in mindfulness in education may also advance this kind of on-going assessment and refinement of implementation in a school.

Conclusions

Over roughly the past 15 years, school-based mindfulness programs have grown rapidly in PreK–12 educational settings. As with many educational innovations, the introduction of SBMPs has outpaced research on their potential effectiveness across diverse sociocultural contexts, school environments, and student ages and backgrounds. Nonetheless, the past 15 years also marks considerable progress in this nascent field of practice and research.

Our review reveals that SBMPs for students show promising impacts on students' mindfulness and self-regulation skills, reductions in feelings of anxiety and depression, and improvements in physical health and relationships with others. Little consistent evidence was found that such programs reduce students' anger and aggression or improve their well-being; and further study is needed to adequately assess program impacts on students' school behavior and performance.

As the state of the science continues to evolve, and as the use of mindfulness programs in PreK-12 school settings continues to expand, we hope for a more definitive and nuanced evidence-based understanding of the benefits and costs of such programs for students, schools, and communities.

Dedication

This brief is dedicated to Dr. Douglas Alan Nyquist, Rebecca Baelen's father, who passed away in 2020. Dr. Nyquist viewed education as an essential tool for empowering and inspiring the next generation. He was an advocate for school-based efforts to help young people become more conscious and self-aware. Through his work as a dentist and dental educator, he was committed to teaching his patients and students how to care for themselves and reach their fullest potential. May his spirit and legacy live on through this work. "No hurry, no worry."

Suggested Citation

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Brian M. Galla, Ph.D., is assistant professor of applied developmental psychology, School of Education, and research scientist, Learning Research and Development Center, University of Pittsburgh. He received his Ph.D. in psychological studies in education from the University of California, Los Angeles. He holds undergraduate degrees in science pre-professional studies, and film, television, and theatre from the University of Notre Dame, and a master's degree in communications from Syracuse University. Dr. Galla's research examines how self-control and mindfulness contribute to positive development from adolescence to young adulthood. He conducts observational studies and randomized experiments in laboratory, school, and community settings that are designed to gain an understanding of how self-control and mindfulness operate, develop, and can be changed.

Rebecca Baelen, Ph.D., is a recent graduate of the University of Pennsylvania. Her research focuses on the design and effects of mindfulness-based practices and positive psychological interventions in educational settings and organizations. Before beginning her doctoral work, she spent five years as a classroom teacher, working in a wide range of classroom settings. In her last two years of teaching, she earned a master's in education from the University of Pennsylvania, studying approaches to fostering empathy in students. After completing her master's degree, Dr. Baelen worked as a research coordinator for Dr. Angela Duckworth at the Positive Psychology Center at the University of Pennsylvania, where she studied character development in adolescence and the effects of mindfulness practices in adults and youth. For her doctoral dissertation, she designed and tested a brief self-compassion intervention for beginning teachers in a field-based randomized controlled trial experiment (study funded by the Mind & Life Institute).

Endnotes

I. See the supplementary materials for the technical details of the scientific studies reviewed here.

II. Developing mindfulness requires effortfully and intentionally invoking the state of mindfulness over and over again. Invoking mindful states repeatedly over time through practice is thought to develop a more enduring mental trait, whereby moment-to-moment experience is imbued with quality of wakeful, non-judgmental awareness.[5]

III. The process by which sustained practice turns a mental state into a mental trait is called neuroplasticity by brain scientists5 and learning or skill development by learning scientists.[6,7]

IV. Because the neural networks in the brain that underlie skills like focused attention and mindfulness continue to develop (e.g., are relatively malleable or plastic) over the entire P–12 period, these years are hypothesized to be a prolonged "window of opportunity" for cultivating them through enrichment efforts like SBMPs.

V. We acknowledge that other processes not included in this Logic Model may account for program impacts on student outcomes (e.g., improved teacher-student relationships, increased school belonging).

VI. See Supplementary Tables 2 and 3 in the Appendix for a full description of studies and characteristics.

VII. In 10 of the reviewed studies (19%), the authors did not note if the school was public or private.

VIII. In 23 of the reviewed studies (43%), data on students' socioeconomic background was not included.

IX. The yellow bars in Figure 3 depict student outcomes assessment in this collection of studies and are arranged in the order of most studied to least studied outcomes in these studies.

X. For instance, if 2 studies examined program impacts on outcome X and only 1 study showed a significant impact for students in mindfulness vs. the control group on outcome X, the hit rate for outcome X would be 50% (or ½ = 0.50 or 50%).

XI. 64% positive impacts; 25/39—across all three age categories, leading us to conclude that SBMPs improve students' mindfulness and self-regulatory skills.

XII. In a few of the secondary school studies, the samples included both 7th and 8th grade students, in addition to 9th to 12th grade students in the sample. Thus, these grade-level categories are not perfect in our review. This study is one of the studies coded as "secondary" even though it involved 7th to 8th graders as well.

XIII. N = 21 studies

XIV. The hit rates for these outcomes were both 38%, well below the 50th percentile (see Figures 3 and 4).

XV. One caveat to our conclusions about well-being: we did observe that one of the 6 studies with majority low-income students found impacts of SBMPs on psychological well-being, whereas 5 out of 7 studies conducted with non-majority student populations did. This suggests that such programs may provide differential benefits for well-being for those in low vs. mixed vs. higher-income communities, an observation to attend to in future research.

XVI. N = 14 studies

XVII. N = 14 studies

XVIII. The above-threshold hit rate (57%) for SMBPs on health outcomes was primarily due to targeted studies of secondary school student populations, especially African-American students who were at risk for hypertension.

XIX. Based on an above-threshold hit rate of 57%.

XX. Representing a potential research confound.

XXI. Reflecting a paucity of research on this outcome, especially in secondary schools, and a potential confound in studies done to date.

XXII. See Supplementary Tables 1 and 3 in the Appendix for a description of program characteristics and number of research studies done on that program.

XXIII. Professional development programs aimed at the integration of social emotional learning and mindfulness approaches with equity concerns are available to support education in doing this. See https://www.teleadership.org, for example.

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APPENDIX

Supplementary Materials: Methodology for Selection of Research Studies

To gain a deeper understanding of the evidence to date for SBMPs in P–12 grades, we reviewed existing studies based on several sources. First, we examined the studies that were included in recent systematic reviews and meta-analyses on the effects of mindfulness training programs for children and youth[A1–A9]. We also reviewed studies in the *Mindfulness Research Monthly* newsletter—a bulletin created by the American Mindfulness Research Association to notify its readership about recently published studies on topics related to mindfulness. We reviewed newsletters from the past two years as a way to identify recent studies that may not have been included in the systematic reviews or meta-analyses mentioned previously. The time period of our review covers the years 2000 through September 2019.

Beginning with a larger pool of possible studies, we selected only **studies in the English language** that met a specific set of inclusion criteria. Specifically, we reviewed only **studies conducted during the school day** (excluding studies of after-school, clinical, or community-based programs). Second, studies were excluded that did not have an explicit mindfulness component. Third, studies had to meet a minimum level of scientific rigor. Specifically, we only included **studies that were peer-reviewed, published, and used experimental designs**; that is, randomized controlled or matched-comparison group designs. In other words, we only included studies examining the impacts of SBMPs on student outcomes *compared to a scientifically defensible comparison group of students who did not receive the program*. Finally, we **excluded studies with fewer than 30 total participants** so that sample sizes were minimally sufficient to assess program impacts. Applying these inclusion criteria, we identified 54 studies of SBMPs for students (see **Supplementary Table 2**).

These 54 studies evaluated 36 different mindfulness programs (see **Supplementary Table 1**). For the majority of these SBMPs, there was only a single research study associated with them (78%, 28 programs). Eight of the 36 programs (22%) had more than one study associated with them (range = 2–6 studies). Indeed, these 8 programs, listed in **Supplementary Table 3**, accounted for 46% of the studies (n = 25) in this review.

Appendix References

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SUPPLEMENTARY TABLES 1-3

SUPPLEMENTARY TABLE 1
Programs in Reviewed Studies

Program Name	Description of Program Components	Research Studies	Program Type	Session Length & Frequency	Est. Program Time (mins.)	Facilitation	Homework
Adapted MBCT for Reducing Eating Disorders	Adapted MBCT: Mindfulness- and acceptance- based exercises (specifically related to body image) and interactive activities	*Atkinson & Wade, 2015*	Curricular Programming (Adapted from MBCT)	90 min. 3x/week for 1 week	270	External Facilitator (First author & graduate students; graduate student received 2-hr. individual training from first author)	Encouraged
Adapted MBSR	Adapted MBSR: Lessons on mindfulness principles, mindfulness practices, and group discussions	*Huppert & Johnson, 2010; Quach, Jastrowski, & Alexander, 2016; Tarrasch, 2018*	Curricular Programming (Adapted from MBSR)		323	Studies of program varied (some used classroom teachers to facilitate programming and others used external facilitators)	Studies of program either encouraged homework/home practices or did not report about homework/home practice
Adapted MBSR for Urban Youth	Adapted MBSR: Lessons on mindfulness concepts, mindfulness practices, and group discussions	*Sibinga et al., 2013, 2016*	Curricular Programming (Adapted from MBSR)		600	Studies of program used external facilitators to facilitate programming	Studies of program either encouraged homework/home practices or did not report about homework/home practice
Attention Academy	Breathing exercises, body scans, mindful movement, and sensorimotor awareness activities	*Napoli, 2005*	Curricular Programming (Novel)	45 min. 2x/month for 24 weeks (12 total sessions)	540	External facilitator (trained mindfulness instructor)	Not reported
BiNKA Training	Adapted MBSR: Focus on consumption-related topics and exercises	*Bohme et al., 2018*	Curricular Programming (Adapted from MBSR)	90 min. 1x/week for 8 weeks; half day session (4 hours); 15 min. daily mindfulness practice using guided audio recordings (at home or at school)	1560	External facilitator (trained mindfulness instructor)	Encouraged
Breathing Awareness Meditation	Primary breathing practice of MBSR	*Barnes et al., 2004, 2008; Gregoski et al., 2008; Wright et al., 2011*	Brief Practices		600	Studies of program used classroom teachers to facilitate programming	Studies of program required home practices
Call-to-Care	Mindfulness and compassion-based intervention drawn from Sustainable Compassion Training (SCT; Makransky, 2007) that incorporates skills and exercises from Enhancing Resiliency and Promoting Pro-Social Behavior program (ESPS; Berger, 2014): Mindfulness and compassion exercises (e.g., focus on breathing), group activities, social- emotional skill-building, and homework assignments involving parent engagement	*Berger et al., 2018*	Curricular Programming (Novel)	45 min. 1x/ week for 24 weeks; 5 Min. daily mindfulness practice led by classroom teacher	1680	External facilitator (trained graduate/ research assistants) and trained classroom teachers	Encouraged
CBT + Mindfulness Meditation	Introduce cognitive model of interplay between thoughts, emotions and behaviors, and mindful breathing exercises	*Patton et al., 2019*	Curricular Programming (Novel)	3 sessions (designed to be 110 minutes in total, but varied by school, on average lasted between 110-220 min., 173 minutes)	519	External facilitator (trained graduate students)	Not reported
Compassion and Attention in the Schools (COMPAS)	Three practices: 1) recorded practice, involving relaxation, mindful breath meditation, and instructions to become aware of body and surroundings; 2) recording of a guided visualization practice involving compassion; 3) mindful reflection on and mentalization of friendship, well-being and compassion	*Terjestam et al., 2016*	Brief Practices	11-20 min. 3x/week for 8 weeks	372	Classroom teacher (attended 3 training sessions for 3-hours each)	Not reported

Program Name	Description of Program Components	Research Studies	Program Type	Session Length & Frequency	Est. Program Time (mins.)	Facilitation	Homework
Health Education with Mindfulness Training	Adapted MBSR: Designed to cultivate awareness of bodily sensations, sounds, visual objects, thoughts, and emotions, mindful movement practices	*Salmoirago-Blotcher et al., 2018*	Curricular Programming (Adapted from MBSR)	45 min 1x/week for 8 weeks; 15 min daily mindfulness practice at school	960	External facilitator (trained mindfulness instructor)	Encouraged
Inner Explorer	Audio-recordings based on MBSR practices (tracks include journal integration exercise)	*Bakosh et al., 2016, 2018*	Brief Practices		450	Studies of program used classroom teachers to facilitate programming	Not reported
Inner Kids	Sitting meditation, body scans, activities, and games (Greenland, 2010)	*Flook et al., 2010*	Curricular Programming (Novel)	30 min 2x/ week for 8 weeks	480	External facilitator (training not specified)	Not reported
Integrative Contemplative Pedagogy	Pedagogical approach that includes 3 practices: 1) breath awareness and breath counting; 2) awareness of thoughts, feelings, and sensations; 3) body sweeps	*Britton et al., 2014*	Brief Practices	3-12 min. 5x/week for 6 weeks	225	Classroom teacher (trained mindfulness instructor)	Not Reported
Kindness Curriculum	Mindfulness-based prosocial skills training: Incorporates children's literature, music, and movement to teach kindness and compassion	*Flook et al., 2015*	Curricular Programming (Novel)	20-30 min. 2x/week for 12 weeks	600	External facilitator (trained mindfulness instructor)	Not reported
Learning to BREATHE (L2B)	Adapted MBSR: Lessons on core mindfulness principles, discussions, and mindfulness practices	*Broderick & Metz, 2009; Fung et al., 2019; Metz et al., 2013*	Curricular Programming (Adapted from MBSR)		445	Studies of program varied (some used classroom teachers to facilitate programming and others used external facilitators)	Encouraged or Not Reported
Master Mind	Mindful breathing, mindful movement, real- world applications of mindfulness principles, meditation practices, and substance-abuse prevention	*Parker et al., 2014*	Curricular Programming (Novel)	15 min. 5x/week for 4 weeks (20 total sessions)	300	Classroom teacher (attended 8-hour training with program developer)	Not reported
MindUP	Mindfulness practices, lessons on mindfulness principles and social-emotional understanding, lessons to teach about the brain, labeling feelings, and impulse control	*Schonert-Reichl et al., 2015; Thierry et al., 2016, 2018*	Curricular Programming (Novel)		1028	Studies of program used classroom teachers to facilitate programming	Not reported
Mindful Education	Lessons to teach mindfulness skills and principles, and mindful attention training practices	*Schonert-Reichl & Lawlor, 2010*	Curricular Programming (Novel)	40-50 min. 1x/week; 3 min. mindfulness practices 3x daily for 10 weeks	900	Classroom teacher (attended 1-day training)	Not reported
Mindful Schools	Breath and body exercises, sensory exercises (e.g., listening), mindfulness of thoughts and emotions, teachers learn about neurobiology of mindfulness and teach this to students	*van de Weijer et al., 2014*	Curricular Programming (Novel)		360	Studies of program used external facilitators to facilitate programming (one study also involved classroom teachers)	Encouraged or Not Reported
Mindful Yoga Curriculum	Meditation and centering exercises, stretching and gentle movements, yoga postures (Miller et al., 2014)	*Fishbein et al., 2015*	Curricular Programming (Novel)	50 min. 3x/week (20 sessions total)	1000	External facilitator (certified yoga instructors)	Not reported
Mindfulness + Reflection Training	Brief mindfulness and relaxation exercises, reflection training through executive function games	*Zelazo et al., 2018*	Curricular Programming (Novel)	24 min. 5x/week for 6 weeks (20 total sessions)	720	Classroom teacher (attended 1-day training)	Not reported
Mindfulness Based Cognitive Therapy for Children (MBCT-C)	Adapted MBCT: Mindfulness practices, games, activities, and movement	*Wright et al., 2019*	Curricular Programming (Adapted from MBCT)	90 min. 1x/week for 10 weeks (10 total sessions)	900	External facilitator (graduate students trained in MBSR & curriculum)	Encouraged
Mindfulness Curriculum (Improving Children's Eating Behaviors)	Using five senses to explore foods and increase non-judgment and awareness about food, mindful eating exercises, and group/one- on-one activities (adapted from existing materials: Greenland, 2010; Kluge, 2015)	*Dial et al., 2019*	Curricular Programming (Novel)	15-30 min. 2x/week for 5 weeks (10 total sessions)	225	External facilitator (trained in curriculum)	Encouraged (take-home handouts given to parents to reinforce concepts at home)
Mindfulness Emotional Intelligence Training Program	Mindfulness training exercises designed to train attention to breath, body, and senses (Ramos, Recondo, & Enriquez, 2012)	*Ricarte et al., 2015*	Brief Practices	15 min. 1x/week for 6 weeks	90	Not specified	Not reported

Program Name	Description of Program Components	Research Studies	Program Type	Session Length & Frequency	Est. Program Time (mins.)	Facilitation	Homework
Mindfulness Enhancement Program	Sitting meditation practices, games, and group discussion	*Raveepatarakul et al., 2014*	Curricular Programming (Novel)	45-60 min. 1x/week for 6 weeks	315	External facilitator (study researcher; training not specified)	Required (10-15 min 6x/week)
Mindfulness Group Program	Components of MBSR and MBCT: Mindfulness practices, group discussions, and lessons on mindfulness principles	*Raes et al., 2014*	Curricular Programming (Adapted from MBSR & MBCT)	100 min. 1x/week for 8 weeks	800	External facilitator (trained mindfulness instructor; trained in curriculum)	Required (15 min daily)
Mindfulness in Schools Programme (.b or Paws b)	Adapted MBSR & MBCT: Lessons on mindfulness principles and mindfulness exercises	*Campbell et al., 2019; Johnson et al., 2016, 2017; Kuyken et al., 2013; Sanger et al., 2018; Vickery & Dorjee, 2016; Volanen et al., 2020*	Curricular Programming (Adapted from MBSR & MBCT)		399	Studies of program varied (some used classroom teachers to facilitate programming and others used external facilitators, while others used both)	Encouraged or Not Reported
Mindfulness-Oriented Meditation Training (MOM)	Sessions consisted of 3 types of mindfulness- oriented meditations (adapted from MBSR and MOM programming conducted with adults): 1) mindfulness of breathing; 2) mindfulness of body parts; 3) mindfulness of thoughts	*Crescentini et al., 2016*	Curricular Programming (Adapted from MBSR & MOM)	3x/week for 8 weeks (gradual increase in program time: 30 min. for weeks 1-2, 45-55 min. for weeks 3-4; 1hr. for weeks 5-8)	1080	External facilitator (trained mindfulness instructor)	Not reported
Mindfulness Skills Training	Mindful STOP strategy taught to help students regulate behavioral and emotional responses (students are taught rules of this strategy and discuss barriers to behaving at "their best")	*Long et al., 2018*	Curricular Programming (Novel)	90 min. 2x/week for 4 and a half weeks (8 sessions total)	720	Classroom teacher (attended 60- min. training)	Not reported
Mindfulness Training for Teens	Adapted MBSR & MBCT: Guided sitting or lying meditation exercises, group inquiry, and interactive presentations of mindfulness concepts	*Johnson & Wade, 2019*	Curricular Programming (Adapted from MBSR & MBCT)	90 min. 1x/week for 8 weeks	720	External facilitator (trained mindfulness instructor)	Encouraged
MindKinder	Pre-recorded guided audio tapes of mindfulness meditation techniques, mandalas, visualization techniques, and body awareness exercises	*Moreno-Gomez & Cejudo, 2018*	Brief Practices	15 min. 6x/week for 6 months (144 total sessions)	2160	Classroom teacher (attended 4-hour training)	Not reported
No Formal Program Name	Mindfulness activities, mindfulness practices, and discussions (activities drawn from Planting Seeds: Practicing Mindfulness with Children [Nhat Hahn, 2011]; Still Quiet Place: Practices for Children and Adolescents to Discover Peace and Happiness [Saltzman, 2008])	*Viafora et al., 2014*	Curricular Programming (Novel)	45 min. 1x/week for 8 weeks	360	External facilitator (trained mindfulness instructor)	Encouraged
OpenMind	Mindfulness-based practices and activities to develop prosocial behavior and parent training (3 - 2hr. training sessions)	*Jackman et al., 2019*	Brief Practices	Daily practices and activities (time not specified)		Classroom teacher (attended 5-day training)	Not reported
Pause, Breathe, Smile	Body and breath-based practices, short mindfulness breathing practices reflections, metaphors for mindfulness concepts, and games	*Devcich et al., 2017*	Curricular Programming (Novel)	60 min. 1x/week for 8 weeks	480	External facilitator (trained mindfulness instructor & program developer)	Not reported
Stress Reduction and Mindfulness Curriculum	Yoga poses, breathing techniques, group discussions, and mindfulness practices	*Mendelsohn et al., 2010*	Curricular Programming (Novel)	45 min. 4x/week for 12 weeks	2160	External facilitator (trained in curriculum)	Not reported
YogaKids	Brief mindfulness practices and yoga poses	*Bergen-Cico & Razza, 2016*	Brief Practices	4 min. 3x/week for entire school year	480	Classroom teacher (certified yoga teacher; attended 30-hour training in YogaKids program)	Not reported

Notes: Estimated program time was calculated by adding all in-class program/practice time--does not include time for out-of-class practice, even when required. For program type, brief practices indicated programming where sessions involved engaging in various mindfulness-based practices that never exceeded 20 minutes.

SUPPLEMENTARY TABLE 2

Reviewed Studies and Student Outcomes

STUDY		STUDY CHARACTERISTICS										
Citation	Program Name	Estimated In-Class Program Time (minutes)	Targeted vs. Universal Program Administration	Facilitation	Majority Racial/ Ethnic Minority or Immigrant Student Sample	Majority Low-Income Student Sample	School Type	School Location	School Level	Average Age (Grade)	Sample Size	Measures to Assess Implementation
Dial et al. (2019)	Mindfulness Curriculum (Improving Children's Eating Behaviors)	225	Universal	EF	No	No	NA	Rural Child Care Centers in Northwest Ohio (US)	Pre-K	3–5 (pre-K)	52	Not specified
Flook et al. (2015)	Kindness Curriculum	600	Universal	EF	No	No	Public	Urban Elementary Schools in Midwest (US)	Pre-K	4–7 (pre-K)	66	Not specified
Jackman et al. (2019)	OpenMind	NA	Universal	CT	No	Yes	Public	Head Start Programs in Suburban & Rural Counties in Missouri (US)	Pre-K	3.67 (pre-K)	262	Teacher surveys of program feasibility and acceptability
Thierry et al. (2016)	MindUP	975	Universal	CT	Yes; Majority Hispanic Students	Yes	Public	Urban Elementary Schools in Southwest (US)	Pre-K	4.55 (pre-K)	47	Teacher surveys about lessons, breathing practices, and student engagement
Thierry et al. (2018)	Adaptation of MindUP	NA	Universal	CT	Yes; Majority Hispanic Students	Yes	Public	Urban Elementary Schools in Southwest (US)	Pre-K	4.47; 4.54 (pre-K, treatment; pre-K, control)	296	Teacher observations 2x/month by outside educator and mental health consultants; teachers rated on lesson completion and student engagement
Zelazo et al. (2018)	Mindfulness + Reflection Training	720	Universal	CT	Yes; Majority Hispanic Students in Houston, TX & Majority African American Students in Washington D.C.	Yes	Public	Urban Elementary Schools in Houston, TX and Washington D.C. (US)	Pre-K	57 months (pre-K)	218	Not specified

Student Outcomes, Pre-K

STUDY	STUDENT OUTCOMES	CODED STUDENT OUTCOMES							
Citation	Reported Measures Assessed	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well- Being	Physical Health	Healthy Relationships	School Behaviors & Performance
Dial et al. (2019)	Number of senses used in food tasting, words used to describe toys, and new foods tried	✓					✓		
Flook et al. (2015)	Teacher reports of students' social competence (i.e., prosocial behavior and emotion regulation sub-scales), student grades; behavioral tasks of executive functioning, self- control, and prosocial behavior		✓					✓	✓
Jackman et al. (2019)	Behavioral tasks of executive functioning; teacher reports of executive functioning		✓						
Thierry et al. (2016)	Teacher and parent reports of student executive functioning; test of receptive vocabulary and computer-based assessment of reading skills		✓						✓
Thierry et al. (2018)	Behavioral tasks of executive functioning; teacher reports of student prosocial behavior; test of students' academic skills		✓					✓	✓
Zelazo et al. (2018)	Performance tasks of executive function and theory of mind; teacher- and parent-reports of students' behavior (i.e, impulsivity, negative affect, effortful control); test of early literacy		✓	✓	✓				✓

Student Impacts, Pre-K

STUDY	STUDENT IMPACTS	CODED STUDENT IMPACTS							
Citation	Reported Program Impacts On Student Outcomes	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well- Being	Physical Health	Healthy Relationships	School Behavior & Performance
Dial et al. (2019)	Improved senses used in tasting activity and more descriptive words to describe toys; no effects on willingness to try new foods	✓							
Flook et al. (2015)	Improved prosocial behavior, report card grades, and social competence (emotion regulationa prosocial behavior sub-scales; teacher-report); no effects on executive functioning or self-control							✓	✓
Jackman et al. (2019)	Improved executive functioning on one behavioral task (no difference on other task); decreased cognitive flexibility; no effects on metacognition, inhibitory self-control or overall executive functioning score		✓						
Thierry et al. (2016)	Improved executive functioning (teacher report, not parent report); improved vocabulary and reading scores at 1-year follow-up; no effect on receptive vocabulary at immediate post-test		✓						✓
Thierry et al. (2018)	Improved executive functioning; no effects on prosocial behavior or academic skills		✓						
Zelazo et al. (2018)	Improved composite scores of executive functioning and performance on one executive function task (effects maintained at follow-up); no effects on theory of mind or early literacy; teacher-reports of effortful control were higher for literacy group compared to mindfulness and business-as-usual control groups; no effects on other measures of behavior (parent participation was low, so parent reports were not provided)		✓						

Reviewed Studies, K-8

STUDY		STUDY CHARACTERISTICS											
Citation	Program Name	Estimated In-Class Program Time (Minutes)	Targeted Vs. Universal Program Administration	Facilitation	Majority Racial/ Ethnic Minority or Immigrant Student Sample	Majority Low-Income Student Sample	School Type	School Location	School Level	Average Age (Grade)	Sample Size	Measures To Assess Implementation	Study Follow-Up
Bakosh et al. (2016)	Inner Explorer	400	Universal	CT	No	No	Public	Suburban Elementary School in Illinois (US)	K–8	nr (3)	191	Logs of teachers' daily activities; teachers completed feedback surveys about program feasibility	None
Bakosh et al. (2018)	Inner Explorer	500	Universal	CT	Yes; Majority Hispanic (1 school)	Yes	Public	Suburban & Rural Elementary Schools in Illinois and New York (US)	K–8	nr (1–5)	337	Daily teacher surveys of implementation & program fidelity	None
Barnes et al. (2004)	Breathing Awareness Meditation (BAM)	600	Universal	CT	Yes; Majority African American Students	NA	Public	Suburban Middle School in Georgia (US)	K–8	12.3 (7)	73	Not specified	None
Bergen-Cico et al. (2015)	YogaKids	480	Universal	CT	No	NA	Public	Urban Middle School in Massachusetts (US)	K–8	11.3 (6)	144	Logs of teachers' daily activities; comments on program feasibility; parent and student feedback	None
Berger et al. (2018)	Call-to-Care Israel	1680	Universal	EF & CT	No	No	Public	Urban Elementary Schools in Tel Aviv & Rishon LeZion (Israel)	K–8	nr (3–5)	324	Regular observations by first-author; off-site supervision provided to facilitators	6-months
Britton et al. (2014)	Integrative contemplative Pedagogy	225	Universal	CT	No	No	Private	Urban Middle School in Rhode Island (US)	K–8	11.8 (6)	101	Not specified	None
Crescentini et al. (2016)	Mindfulness-Oriented Meditation (MOM) Program	1080	Universal	EF	No	NA	NA	School in Brugnera, PN (Italy)	K–8	7.3; 7.4 (treatment; control)	31	Not specified	None
Devcich et al. (2017)	Pause, Breathe, Smile	480	Universal	EF	No	No	Public	Urban Elementary School in Auckland (New Zealand)	K–8	10.2 (4–5)	91	Student-reports of program acceptability	3 months
Flook et al. (2010)	Inner Kids	480	Universal	EF	Yes: Majority Racial/ Ethnic Minority Students	NA	NA	Urban Elementary School in California (US)	K–8	8.2 (2–3)	64	Not specified	None
Johnson et al. (2016)	Mindfulness in Schools Project (.b)	380	Universal	EF	No	No	Private & Public	Middle Schools in Adelaide (Australia)	K–8	13.63 (7–8)	308	Teacher and student feedback on program acceptability; student home practice surveys	3 months
Johnson et al. (2017)	Mindfulness in Schools Project (.b)	450	Universal	EF & CT	No	No	Private & Public	Middles Schools in Australia	K–8	13.44 (nr)	555	Competence of instructor and fidelity of program lessons assessed; student home practice surveys; parent and	6 and 12 months

STUDY		STUDY CHARACTERISTICS											
Citation	Program Name	Estimated In-Class Program Time (Minutes)	Targeted Vs. Universal Program Administration	Facilitation	Majority Racial/ Ethnic Minority or Immigrant Student Sample	Majority Low-Income Student Sample	School Type	School Location	School Level	Average Age (Grade)	Sample Size	Measures To Assess Implementation	Study Follow-Up
Long et al. (2018)	Mindfulness Skills Training	720	Universal	CT	Yes; Majority African American Students	Yes	Public	Urban Alternative Elementary School in Southeast (US)	K–8	11.69 (5)	73	Teacher self-monitoring of implementation (self-ratings of implementation at the end of each lesson); weekly check-in calls with study investigators	None
Mendelsohn et al. (2010)	Stress Reduction and Mindfulness Curriculum	2160	Universal	EF	Yes; Majority African American Students	Yes	Public	Urban Elementary School in Maryland (US)	K–8	10.1 (4–5)	97	Qualitative feedback from students and teachers about program acceptability and feasibility	None
Moreno-Gomez & Cejudo (2018)	MindKinder	2160	Universal	CT	No	NA	NA	Elementary School (Spain)	K–8	5.08 (Kin-dergarten)	74	None	6 months
Napoli et al. (2005)	Attention Academy	540	Universal	EF	No	NA	Public	Urban Elementary School in Southwest (US)	K–8	nr (1–3)	194	Not specified	None
Parker et al. (2014)	Master Mind	300	Universal	CT	No	NA	Public	Elementary School in Southeast (US)	K–8	10.09 (4–5)	111	Observations of implementation fidelity; teacher interviews and surveys about program feasibility and acceptability	None
Raveepatarakul et al. (2014)	Mindfulness Enhancement Program	315	Universal	EF	NA	NA	NA	Elementary & Middle School (Thailand)	K–8	8–11 (nr)	82	Not specified	2 weeks
Ricarte et al. (2015)	Adaptation of Mindfulness Emotional Intelligence Training Program	90	Universal		No	Yes	NA	Rural Elementary & Middle School (Spain)	K–8	6–13 (1–6)	90	Not specified	None
Schonert-Reichl & Lawlor (2010)	Mindful Education	900	Universal	CT	No	No	Public	Urban Elementary & Middle School (Canada)	K–8	11.4 (4–7)	246	Biweekly consultations with program developers; teacher logs of implementation and surveys about program feasibility and acceptability	None
Schonert-Reichl et al. (2015)	MindUP	1080	Universal	CT	No	No	Public	Urban Elementary Schools (Canada)	K-8	10.24 (4-5)	99	Teacher surveys about implementation quality and frequency, and daily logs of program implementation	None
Sibinga et al. (2013)	Adaptated MBSR for Urban Youth	600	Universal	EF	Yes; Majority African American Students	Yes	Public	Urban application-based tuition free middle school in Maryland (US)	K-8	12.5 (7-8)	41	Not specified	3-Months
Sibinga et al. (2016)	Adapted MBSR for Urban Youth	600	Universal	EF	Yes; Majority African American Students	Yes	Public	Urban Elementary & Middle School in Maryland (US)	K-8	12.0 (5-8)	300	Program instructors met regularly to ensure consistency of implementation	None

STUDY		STUDY CHARACTERISTICS											
Citation	Program Name	Estimated In-Class Program Time (Minutes)	Targeted Vs. Universal Program Administration	Facilitation	Majority Racial/ Ethnic Minority or Immigrant Student Sample	Majority Low-Income Student Sample	School Type	School Location	School Level	Average Age (Grade)	Sample Size	Measures To Assess Implementation	Study Follow-Up
Tarrasch (2018)	Adapted MBSR	450	Universal	EF	No	NA	Public	Urban Elementary School in Tel Aviv (Israel)	K-8	10.1; 9.2; 11.1 (Grade 4, treament; Grade 3, control; Grade 5, control)	101	Weekly student feedback shared with classroom teacher about experiences, difficulties, and program in general	None
Terjestam et al. (2016)	Compassion and Attention in the Schools (COMPAS)	372	Universal	CT	No	No	Public	Elementary & Middle Schools (Sweden)	K-8	(5,7-8)	358	Teachers received supervision 1x/week regarding issues of implementation and corrective feedback was provided; no formal measures of implementation fidelity, but informal checks of implementation fidelity occurred during supervision	None
van de Weijer-Bergsma et al. (2014)	Mindful Schools (Adaptation)	360	Universal	EF & CT	Yes; Majority Immigrant Students	NA	NA	Urban Elementary School in Amsterdam (Netherlands)	K-8	9.3 (3-5)	199	Not specified	2-months
Viafora et al. (2015)	No formal program name	360	Universal	EF	Yes; Majority Hispanic Students	Yes	Public	Urban middle schools in California (US)	K-8	11-13 (6-8)	63	Not specified	None
Vickery & Dorjee (2016)	Mindfulness in Schools Project (Paws b)	360	Universal	CT	No	NA	Public	Elementary schools in North Wales (UK)	K-8	7.9 (3-4)	71	Not specified	3-months
Viglas & Perlman (2017)	Mindful Schools	360	Universal	EF	NA	Yes	Public	Elementary school in Toronto (Canada)	K-8	5.15 (Kin-dergarten)	127	Not specified	None
Volanen et al. (2020)	Mindfulness in Schools Project (.b)	405	Universal	EF	NA	NA	Public	Middle Schools in Cities & Municipalities (Finland)	K-8	12-15 (6-8)	3519	Not specified	15 weeks (following completion of training)
Wright et al. (2019)	Mindfulness Based Cognitive Therapy for Children (MBCT-C)	900	Targeted : Students experiencing internalizing difficulties	EF	No	Yes	Private & Public	Urban and Suburban Elementary Schools (Australia)	K-8	10.6 (4-6)	89	Observations of implementation by program supervisors; weekly facilitator feedback reports of implementation (facilitators assessed student reactions to content and levels of home practice); teacher, parent, and student surveys of program acceptability	None

Student Outcomes, K-8

STUDY	STUDENT OUTCOMES	CODED STUDENT OUTCOMES							
Citation	Reported Measures Assessed	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well-Being	Physical Health	Healthy Relationships	School Behaviors & Performance
Bakosh et al. (2016)	Student grades; teacher reports of disruptive classroom behavior								✓
Bakosh et al. (2018)	Student grades for math, social studies, reading, writing, spelling, and verbal communication; GPA								✓
Barnes et al. (2004)	Blood pressure and heart rate; student self-reports of stress, anger, and physical activity			✓	✓		✓		
Bergen-Cico et al. (2015)	Student self-reports of total, short- and long-term self-regulation		✓						
Berger et al. (2018)	Student self-reports of readiness and willingness to engage with Israeli-Palestinian pupils, affective prejudice, and stereotyping							✓	
Britton et al. (2014)	Student self-reports of clinical and sub-clinical symptoms (i.e., internalizing and externalizing symptoms), positive and negative affect, attention problems, and mindfulness	✓		✓	✓	✓			
Crescentini et al. (2016)	Teacher-reports of emotional, social, behavioral, and attentional problems; student-reports of depressive symptoms, somatic complaints, and internalizing and externalizing behaviors			✓	✓				
Devcich et al. (2017)	Student-reports of well-being and mindfulness	✓				✓			
Flook et al. (2010)	Teacher and parent reports of student executive functioning		✓						
Johnson et al. (2016)	Student self-reports of anxiety, depression, weight and shape concerns, well-being, mindfulness, self-compassion, and emotion regulation	✓	✓	✓		✓			
Johnson et al. (2017)	Student self-reports of depression, anxiety, weight and shape concerns, well-being, and mindfulness	✓		✓		✓			
Long et al. (2018)	Teacher reports of student externalizing and internalizing behaviors; student-reports of subjective well-being			✓	✓	✓			
Mendelsohn et al. (2010)	Student self-reports of depression, involuntary responses to stress (i.e., involuntary engagement, rumination, intrusive thoughts, emotional arousal, impulsive action, physiological arousal), positive and negative affect, and relationships with teachers and peers			✓	✓	✓		✓	

STUDY	STUDENT OUTCOMES	CODED STUDENT OUTCOMES							
Citation	Reported Measures Assessed	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well-Being	Physical Health	Healthy Relationships	School Behaviors & Performance
Moreno-Gomez & Cejudo (2018)	Teacher-reports of student psycho-social adjustment (i.e., externalizing and internalizing problems, academic and attention problems); student tests of neuropsychological maturity (i.e., motor skills, language articulation, language comprehension, expressive language, spatial structuring, visual perception, memory, and rhythm)		✓	✓	✓				✓
Napoli et al. (2005)	Student self-reports of test anxiety; Teacher reports of student attention, social skills, oppositional behavior, and hyperactivity; Behavioral measures of attention		✓	✓	✓			✓	
Parker et al. (2014)	Student self-reports of intentions to use substances; teacher reports of student social problems, aggression problems, attention problems, anxiety problems, and self-control; behavioral task of executive functioning		✓	✓	✓		✓		
Raveepatarakul et al. (2014)	Student self-reports of depression and mindfulness	✓		✓					
Ricarte et al. (2015)	Student self-reports of anxiety; behavioral task to assess working memory, visual motor speed, visual scanning, attention, motor function, processing speed and executive function; behavioral task of focused attention and immediate auditory-verbal memory		✓	✓					
Schonert-Reichl & Lawlor (2010)	Student self-reports of optimism, school and self-concept, and positive and negative affect; teacher reports of student social and emotional competence (i.e., aggressive behaviors, oppositional behavior, attention and concentration, social and emotional competence)		✓	✓	✓	✓		✓	✓
Schonert-Reichl et al. (2015)	Student self-reports of emotional control, perspective taking, optimism, mindfulness, social responsibility, school and self-concept, depression; peer nominations of prosociality, aggressiveness, and popularity; student math achievement; behavioral tasks of executive functioning and working memory; cortisol	✓	✓	✓	✓	✓	✓	✓	✓
Sibinga et al. (2013)	Student self-reports of psychological functioning (i.e., anxiety, somatization, hostility), rumination, mindfulness, emotion awareness, anger expression, conflict, depression, perceived stress, and postive and negative coping; sleep and cortisol	✓	✓	✓	✓		✓		
Sibinga et al. (2016)	Student self-reports of mindfulness, positive and negative affect, differential emotions, anger expressivity, psychological symptoms, post-traumatic symptoms, stress, depression, re- experiencing, anxiety, aggression, positive and negative coping, coping, response style/coping, and coping self-efficacy	✓	✓	✓	✓	✓			
Tarrasch (2018)	Behavioral tasks of sustained and selective attention; impulsivity on task also assessed		✓		✓				

STUDY	STUDENT OUTCOMES	CODED STUDENT OUTCOMES							
Citation	Reported Measures Assessed	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well-Being	Physical Health	Healthy Relationships	School Behaviors & Performance
Terjestam et al. (2016)	Student self-reports of well-being at school, psychological distress, stress, peer problems; teacher- reports of effortful control of students		✓	✓	✓	✓			
van de Weijer-Bergsma et al. (2014)	Parent reports of student anxiety, anger/aggression and social competence, sleep; student self- reports of emotional awareness, rumination, happiness, sense of coherence; teacher reports of social climate	✓		✓	✓	✓	✓	✓	
Viafora et al. (2015)	Student self-reports of mindfulness, self-compassion, psychological inflexibility	✓		✓					
Vickery & Dorjee (2016)	Student self-reports of mindfulness, positive and negative affect, well-being, emotional awareness and expression; parent and teacher reports of students' executive functioning	✓	✓	✓		✓			
Viglas & Perlman (2017)	Behavioral task of attention regulation; teacher reports of prosocial and maladaptive behaviors (i.e., prosocial behavior, hyperactivity, conduct problems, emotional symptoms, and peer problems)		✓		✓			✓	
Volanen et al. (2020)	Resilience, depression, and socio-emotional functioning (i.e., emotional problems, conduct problems, hyperactivity, peer problems, and prosociality)			✓	✓	✓		✓	
Wright et al. (2019)	Student reports of anxiety and depression, mindfulness, attention, resilience, life satisfaction; behavioral tasks of switching and sustained attention; teacher, parent and student reports of total difficulties (i.e., emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems) and prosocial behavior	✓	✓	✓	✓	✓		✓	

Student Impacts, K-8

STUDY	STUDENT IMPACTS	CODED STUDENT IMPACTS							
Citation	Reported Program Impacts On Student Outcomes	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well-Being	Physical Health	Healthy Relationships	School Behavior & Performance
Bakosh et al. (2016)	Improved reading and science grades; reduced disruptive classroom behavior; no effects on math, spelling, writing or social studies grades								✓
Bakosh et al. (2018)	Improved math and social studies grades, and GPA; no effects on reading, writing, spelling or verbal communication								✓
Barnes et al. (2004)	Reduced resting systolic blood pressure, after-school systolic and diastolic blood pressure, and after-school heart rate; no effects on stress and anger, both groups showed an increase in physical activity						✓		
Bergen-Cico et al. (2015)	Improved total and long-term regulation; no effect on short-term regulation		✓						
Berger et al. (2018)	Reduced affective prejudice and negative stereotyping about Israeli-Palestinian outgroup; improved readiness to engage with Israeli-Palestinian outgroup; effects sustained at 6-month follow-up							✓	
Britton et al. (2014)	Reduced suicidal ideation; no effects on other internalizing symptoms or externalizing symptoms, positive or negative affect, attention or mindfulness			✓					
Crescentini et al. (2016)	Reduced attentional and internalizing problems (teacher-report); no effects on depressive symptoms (student-report) or hyperactivity (teacher-report); No effects on emotional or social problems (teacher-report)			✓	✓				
Devcich et al. (2017)	Improved well-being and mindfulness; indication of sustainability of effects at follow-up	✓				✓			
Flook et al. (2010)	Improved executive functioning for students with low executive functioning at baseline								
Johnson et al. (2016)	No effects on anxiety, depression, weight and shape concerns, emotion regulation, mindfulness, self-compassion or well-being immediately or at 3-month follow-up								
Johnson et al. (2017)	No effects on depression, anxiety, weight and shape concerns, mindfulness or well-being at 6- or 12- month follow-up								
Long et al. (2018)	No effects								
Mendelsohn et al. (2010)	Reduced rumination, intrusive thoughts, and emotional arousal; no effects on depression, positive affect, or relationships with teachers or peers			✓					

STUDY	STUDENT IMPACTS	CODED STUDENT IMPACTS							
Citation	Reported Program Impacts On Student Outcomes	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well-Being	Physical Health	Healthy Relationships	School Behavior & Performance
Moreno-Gomez & Cejudo (2018)	Reduced maladaptive dimensions of psycho-social adjustment (i.e., behavioral symptoms index, externalized and academic problems, anxiety, aggression, hyperactivity, attention deficit and learning problems), improved dimensions of neuropsychological maturity (i.e., global development; non-verbal development; visual perception and attention); results sustained at 6-month follow-up		✓	✓	✓				✓
Napoli et al. (2005)	Improved attention and social skills (teacher report); improved selective attention; reduced test anxiety; no effect on sustained attention		✓	✓				✓	
Parker et al. (2014)	Improved executive functioning, self-control (boys only), reduced aggression, social problems, and anxiety (girls only); no effect on intentions to use substances or teacher-rated attention problems		✓						
Raveepatarakul et al. (2014)	Improved mindfulness and reduced depression at 2-week follow-up	✓		✓					
Ricarte et al. (2015)	Reduced anxiety; improved concentration and immediate auditory-verbal memory; no effects on focused attention and working memory		✓	✓					
Schonert-Reichl & Lawlor (2010)	Improved attention and concentration and social and emotional competence, reduced aggression and oppositional/dysregulated behavior (teacher report); improved optimism; improved self- concept for preadolescents, but not early adolescents; no effects on postive or negative affect or school self-concept		✓		✓	✓		✓	
Schonert-Reichl et al. (2015)	Improved executive functioning, math achievement, empathy, perspective taking, emotional control, optimism, school self-concept, mindfulness, peer-rated prosociality and popularity; reduced depression and peer-rated aggressiveness; higher levels of morning cortisol secretion	✓	✓	✓	✓	✓		✓	✓
Sibinga et al. (2013)	Reduced anxiety and rumination; cortisol increased in control group, but not in mindfulness group; no effects on sleep, mindfulness, emotional awareness, coping, anger expression, conflict or perceived stress (3-month follow-up effects not reported)			✓			✓		
Sibinga et al. (2016)	Reduced somatization, depression, rumination, negative coping, negative affect, re-experiencing and post-traumatic symptoms; no effects on mindfulness, anger expressivity, anxiety, aggression, stress, distraction, problem-solving, hostility, paranoid ideation, differential emotions (except for self-hostility), positive coping, coping self-efficacy or positve affect			✓					
Tarrasch (2018)	Improved sustained and selective attention; reduced impulsivity on task		✓		✓				

STUDY	STUDENT IMPACTS	CODED STUDENT IMPACTS							
Citation	Reported Program Impacts On Student Outcomes	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well-Being	Physical Health	Healthy Relationships	School Behavior & Performance
Terjestam et al. (2016)	Improved effortful control (teacher report); improved well-being at school and reduced peer problems over time (only for grade 5 students); no effects on psychological distress or general stress (positive effects associated with number of sessions students participated in, except for general stress)		✓			✓			
van de Weijer-Bergsma et al. (2014)	Improved verbal sharing of emotions and bodily awareness of emotions (student report at post- test); improved differentiating emotions, verbal sharing of emotions, bodily awareness of emotions, not hiding emotions, and sense of coherence (student report at 2-month follow-up); reduced rumination and analyzing emotions (student report at 2-month follow-up); reduced anxiety symptoms and angry/aggressivebehvaviors (parent report at 2-month follow-up); no effects on sleep, subjective happiness or social competence (parent report at either post-test or 2-month follow-up)	✓		✓	✓	✓			
Viafora et al. (2015)	Improved mindfulness; no effects on psychological inflexibility or self-compassion	✓							
Vickery & Dorjee (2016)	Reduced negative affect and improved meta-cognition (teacher report at 3-month follow-up only); reduced meta-cognition (parent-report at 3-month follow-up); no effects on mindfulness, positive affect, well-being, emotional awareness or expression (student report)		✓	✓					
Viglas & Perlman (2017)	Improved attention regulation and prosocial behavior; reduced hyperactivity; no effects on conduct, emotional or peer problems; students lower in attention regulation at baseline benefitted most from the mindfulness program, as did students high in hyperactivity and low in prosociality		✓		✓			✓	
Volanen et al. (2020)	Improved resilience post-training; boosted socio-emotional functioning for 7th graders post-training and at follow-up (not for 6th or 8th graders); reduced depression at follow-up (for girls only); high intensity practice was associated with greater improvements in resilience at follow-up, as well as greater improvements in socio-emotional functioning post-training					✓			
Wright et al. (2019)	No effects								

Reviewed Studies, High School

STUDY	STUDY CHARACTERISTICS											
Citation	Program Name	Estimated In-Class Program Time (minutes)	Targeted vs. Universal Program Administration	Facilitation	Majority Racial/ Ethnic Minority or Immigrant Student Sample	Majority Low-Income Student Sample	School Type	School Location	School Level	Average Age (Grade)	Sample Size	Measures to Assess Implementation	Study Follow-Up
Atkinson & Wade (2015)	Adapted MBCT for Reducing Eating Disorders	270	Universal	EF	No	NA	Private	All Girls' High School (US)	High School	15.7 (9-12)	217	Student and teacher reports of program acceptability	1 and 6 months
Barnes et al. (2008)	Breathing Awareness Meditation (BAM)	600	Targeted: African-American students with high blood pressure	CT	Yes; Majority African American Students	NA	Public	High School (US)	High School	15.2 (9-12)	66	External evaluation of implementation quality	None
Bohme et al. (2018)	BiNKA training	1560	Universal	EF	No	NA	Private	Urban High School in Berlin (Germany)	High School	15.3 (nr)	70	Not specified	None
Broderick & Metz (2009)	Learning to BREATHE (L2B)	375	Universal	EF	No	NA	Private	All Girls' High School in Suburban Pennsylvania (US)	High School	17.43; 16.41 (12, treatment; 11, control)	137	Student surveys to assess program satisfaction, participation and homework practice	None
Campbell et al. (2019)	Mindfulness in Schools Project (.b)	NA	Universal	EF	No	NA	Public	Suburban High School in Northeast (US)	High School	15.96	1,007	Not specified	None
Fishbein et al. (2016)	Mindful Yoga Curriculum	1000	Targeted: Students with academic and behavioral problems	EF	Yes; Majority African American & Hispanic Students	NA	Public	Urban Non-Traditional High School (US)	High School	16.7 (9–12)	85	Not specified	None
Fung et al. (2019)	Learning to BREATHE (L2B)	600	Targeted: Students with elevated mood symptoms	EF	Yes; Majority Hispanic and Asian Minorities	Yes	Public	Urban High School in California (US)	High School	14.0 (9)	145	Adherence coding by trained observers (using L2B adherence coding rubric); weekly supervision by first and second author; student reports of program experience and frequency of meditation practice	3 months
Gregoski et al. (2011)	Breathing Awareness Meditation (BAM)	600	Targeted : African-American students with high blood pressure	CT	Yes; Majority African American Students	Yes	Public	High Schools in Southeastern US	High School	15.0 (9)	166	Observations to assess session quality and implementation fidelity	None
Huppert & Johnson (2010)	Adapted MBSR	160	Universal	CT	No	NA	Private	All Boys' Schools in England (UK)	High School	14–15 (nr)	155	Not specified	None

STUDY	STUDY CHARACTERISTICS											
Citation	Program Name	Estimated In-Class Program Time (minutes)	Targeted vs. Universal Program Administration	Facilitation	Majority Racial/ Ethnic Minority or Immigrant Student Sample	Majority Low-Income Student Sample	School Type	School Location	School Level	Average Age (Grade)	Sample Size	Measures to Assess Implementation	Study Follow-Up
Johnson & Wade (2019)	Mindfulness Training for Teens	720	Universal	EF	No	Yes	Public	Middle & High Schools (Australia)	High School	13–47; 15.47 (Year 8; 10)	90	Student-surveys about program acceptability; teacher and counselor surveys of program acceptability; lessons assessed by program developer (using a random selection of audio recorded lessons); student-ratings of facilitator	4 months
Kuyken et al. (2013)	Mindfulness in Schools Project	NA	Universal	EF & CT	No	NA	Private & Public	High Schools (UK)	High School	14.8 (nr)	522	Student surveys of program acceptability and continuing of mindfulness practice 2–3 months following program; teacher ratings of experience delivering program	2–3 months
Metz et al. (2013)	Learning to BREATHE (L2B)	360	Universal	CT	No	NA	Public	Suburban High School in Pennsylvania (US)	High School	16.5 (10–12)	216	Teacher feedback and fidelity logs; student feedback on satisfaction with program; classroom observations	None
Patton et al. (2019)	CBT + Mindfulness Meditation	519	Universal	EF	No	No	NA	Urban High Schools in Southeast Queensland (Australia)	High School	14.99 (9–10)	404	Not specified	3 and 6 months
Quach et al. (2016)	Adapted MBSR	360	Universal	EF	Yes; Majority Hispanic Students	Yes	Public	Middle & High School in California (US)	High School	13.18 (7–9)	198	Observations of implementation fidelity; student home practice logs	None
Raes et al. (2014)	Mindfulness Group Program	800	Universal	EF	No	NA	NA	High Schools in Flanders (Belgium)	High School	15.4 (9–11)	408	Instructors met 8 times to discuss their experience and adherence to the protocol	6 months
Salmoirago-Blotcher et al. (2018)	Health Education with Mindfulness Training	960	Universal	EF	No	NA	Public	Suburban & Rural High Schools in Massachusetts (US)	High School	14.5	53	Assessed program fidelity by analyzing recorded lessons; teachers completed checklist to determine if planned topics were covered	6 months
Sanger et al. (2018)	Mindfulness in Schools Project (.b)	400	Universal	CT	No	NA	NA	High Schools in North Wales (UK)	High School	16.8 (6th form)	40	Student surveys of program acceptability and home practice frequency	None
Wright et al. (2011)	Breathing Awareness Meditation (BAM)	600	Targeted: African- American students at risk for developing hypertension	CT	Yes; Majority African American Students	Yes	Public	High Schools (US)	High School	15.0 (9)	121	Weekly observations and qualitative assessments of teachers' implementation and student engagement (using rating scales for thoroughness, class attentiveness, and enthusiasm)	3-months

Notes: For facilitation, EF=External Facilitator; CT=Classroom Teacher.

Student Outcomes, High School

STUDY	STUDENT OUTCOMES	CODED STUDENT OUTCOMES							
Citation	Reported Measures Assessed	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well Being	Physical Health	Healthy Relationships	School Behaviors & Performance
Atkinson & Wade (2015)	Student self-reports of weight & shape concerns, psychosocial impairment, eating disorder symptoms, dietary restraint, attitudes towards appearance, negative affect, and mindfulness; body mass index	✓	✓	✓			✓		
Barnes et al. (2008)	Blood pressure, heart rate, and overnight sodium excretion						✓		
Bohme et al. (2018)	Student self-reports of sustainable consumption behavior, sustainable consumption attitudes, material values, compensatory consumption, well-being, mindfulness, mindful eating, compassion, and connectedness to nature	✓				✓	✓	✓	
Broderick & Metz (2009)	Student self-reports of positive and negative affect; emotion regulation; rumination; somatization; self-acceptance/calm/relax	✓	✓	✓		✓			
Campbell et al. (2019)	Student reports of perceived stress, subjective well-being, and emotion regulation		✓	✓		✓			
Fishbein et al. (2016)	Student self-reports of emotional, behavioral, and cognitive dysregulation, impulse control, negative mood, mindfulness, drug use; teacher reports of student externalizing behaviors and social competencies (i.e., conduct problems, social skills, attention problems, aggression); performance tasks of impulse control	✓	✓	✓	✓		✓	✓	
Fung et al. (2019)	Student self-reports of emotional and behavioral problems (e.g., internalizing, externalizing and attention problems), perceived stress, emotion regulation, emotional approach coping, psychological inflexibility, and rumination		✓	✓	✓				
Gregoski et al. (2011)	Student self-reports of stress; blood pressure, heart rate, and overnight sodium excretion			✓			✓		
Huppert & Johnson (2010)	Student self-reports of mindfulness, resilience, and well-being	✓				✓			
Johnson & Wade (2019)	Student-reports of depression, anxiety, weight and shape concerns, and well-being			✓		✓			
Kuyken et al. (2013)	Student reports of depression, stress, and well-being			✓		✓			
Metz et al. (2013)	Student self-reports of emotion regulation, efficacy of emotion regulation, psychomatic complaints, and stress		✓	✓					
Patton et al. (2019)	Student-reports of alcohol use, positive and negative alcohol expectancies; drinking refusal self- efficacy; impulsivity, and mindfulness	✓			✓		✓		

STUDY	STUDENT OUTCOMES	CODED STUDENT OUTCOMES							
Citation	Reported Measures Assessed	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well Being	Physical Health	Healthy Relationships	School Behaviors & Performance
Quach et al. (2016)	Student self-reports of stress, anxiety, and mindfulness; behavioral task of working memory capacity	✓	✓	✓					
Raes et al. (2014)	Student self-reports of depression, anxiety, and stress			✓					
Salmoirago-Blotcher et al. (2018)	Student self-reports of impulsivity				✓				
Sanger et al. (2018)	Student self-reports of mindfulness, perceived stress, empathy, well-being, number of sickness absences and visits to doctor; behavioral task of emotion processing	✓		✓		✓	✓	✓	
Wright et al. (2011)	Blood pressure and heart rate; student reports of hostility				✓		✓		

Notes: Studies received a check mark for assessing a given outcome if they included at least one measure to assess that outcome domain.

Student Impacts, High School

STUDY	STUDENT IMPACTS	CODED STUDENT IMPACTS							
Citation	Reported Program Impacts On Student Outcomes	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well-Being	Physical Health	Healthy Relationships	School Behavior & Performance
Atkinson & Wade (2015)	No effects found at 1- or 6-month follow-up								
Barnes et al. (2008)	Reduced blood pressure, heart rate, and overnight sodium excretion						✓		
Bohme et al. (2018)	Improved food-related sustainable consumption behavior and compassion, but no effects on other outcome measures							✓	
Broderick & Metz (2009)	Decreased negative affect; increased calmness, self-acceptance, and relaxation; no effects on positive affect, emotion regulation, rumination or somatization	✓		✓					
Campbell et al. (2019)	Reduced perceived stress; no effects on subjective well-being or emotion regulation			✓					
Fishbein et al. (2016)	Reduced alcohol use, improved social competency behaviors; no effects on emotional, behavioral, and cognitive dysregulation, mindfulness, mood, impulse control or teacher reports of externalizing behaviors						✓	✓	
Fung et al. (2019)	Reduced internalizing problems, stress, and rumination (immediately post-treatment); improved cognitive reappraisal, emotional processing, and emotional expression (immediately post- treatment); no effects on attention problems, externalizing problems, expressive suppression or avoidance fusion (immediately post-treatment); between group follow-up effects not reported		✓	✓					
Gregoski et al. (2011)	Reduced blood pressure and heart rate; no effects on overnight sodium excretion or stress						✓		
Huppert & Johnson (2010)	No effects on mindfulness, resilience or well-being; home practice associated with improvements in mindfulness and well-being								
Johnson & Wade (2019)	No effects at immediate post-test; moderate improvements in depression and anxiety at 4-month follow up (noted a low response rate at follow-up)			✓					
Kuyken et al. (2013)	Reduced depression and stress (immediately post-intervention and at 3-month follow-up); improved well-being and reduced stress at 3-month follow-up; home practice associated with improvements in well-being and reductions in stress			✓		✓			
Metz et al. (2013)	Improved emotion regulation and efficacy of emotion regulation; reduced psychosomatic symptoms and stress		✓	✓					

STUDY	STUDENT IMPACTS	CODED STUDENT IMPACTS							
Citation	Reported Program Impacts On Student Outcomes	Mindfulness & Self-Compassion	Self-Regulatory Skills	Internalizing Distress	Externalizing Distress	Psychological Well-Being	Physical Health	Healthy Relationships	School Behavior & Performance
Patton et al. (2019)	Both intervention conditions had reduced alcohol use compared to control and increased negative alcohol expectancies; No effects on mindfulness, drinking refusal self-efficacy or impulsivity						✓		
Quach et al. (2016)	Improved working memory; no effects on stress or anxiety; low internal consistency of mindfulness measure and could not be used		✓						
Raes et al. (2014)	Reduced depression at 6-month follow-up; No effects reported for stress or anxiety			✓					
Salmoirago-Blotcher et al. (2018)	Reduced impuslivity; effects maintained at follow-up but were not significant				✓				
Sanger et al. (2018)	Sustained sensitivity to socially relevant, affective stimuli; improved well-being; fewer reported doctor visits; no effects on empathy, mindfulness or perceived stress	✓				✓	✓		
Wright et al. (2011)	Reduced blood pressure and hostility post-program (not at 3-month follow-up); no effects on heart rate reported				✓		✓		

Notes: Studies received a check mark for observing an impact if there was an impact in the hypothesized direction on at least one measure in a given outcome domain.

SUPPLEMENTARY TABLE 3

School-Based Mindfulness Programs for Students and Number of Research Studies[1]

School-Based Mindfulness Program Name	Number of Research Studies on Program
Mindfulness in School Programme (.b or Paws b)	*6*
Breathing Awareness Meditation	*4*
Adapted MBSR	*3*
Learning to BREATHE (L2B)	*3*
MindUP	*3*
Adapted MBSR for Urban Youth	*2*
Inner Explorer	*2*
Mindful Schools	*2*
Adapted MBCT for Reducing Eating Disorders	1
Attention Academy	1
BiNKA Training	1
Call-to-Care	1
CBT + Mindfulness Meditation	1
Compassion and Attention in the Schools (COMPAS)	1
Health Education with Mindfulness Training	1
Inner Kids	1
Integrative Contemplative Pedagogy	1
Kindness Curriculum	1
Kripalu Yoga in the Schools	1
Master Mind	1
Mindful Education	1
Mindful Yoga Curriculum	1
Mindfulness + Reflection Training	1
Mindfulness Based Cognitive Therapy for Children (MBCT-C)	1
Minfulness Curriculum (Improving Children's Eating Behaviors)	1
Mindfulness EMotional Intelligence Training Program	1
Mindfulness Enhancement Program	1
Mindfulness Group Program	1
Mindfulness-Oriented Meditation Training (MOM)	1
Mindfulness Skills Training	1
Mindfulness Training for Teens	1
MindKInder	1
No Formal Program Name	1
OpenMind	1
Pause, Breathe, Smile	1
Stress Reduction and Mindfulness Curriculum	1
YogaKids	1

1 Programs with blue background are those that have more than 1 scientific study associated with them.

Roeser, R. W., Galla, B. M., & Baelen, R. N. (2020). *Mindfulness in schools: Evidence on the impacts of school-based mindfulness programs on student outcomes in P–12 educational settings.* University Park, PA: Edna Bennett Pierce Prevention Research Center, The Pennsylvania State University.