

Mindfulness in Schools:

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



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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.¹ 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
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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
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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
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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
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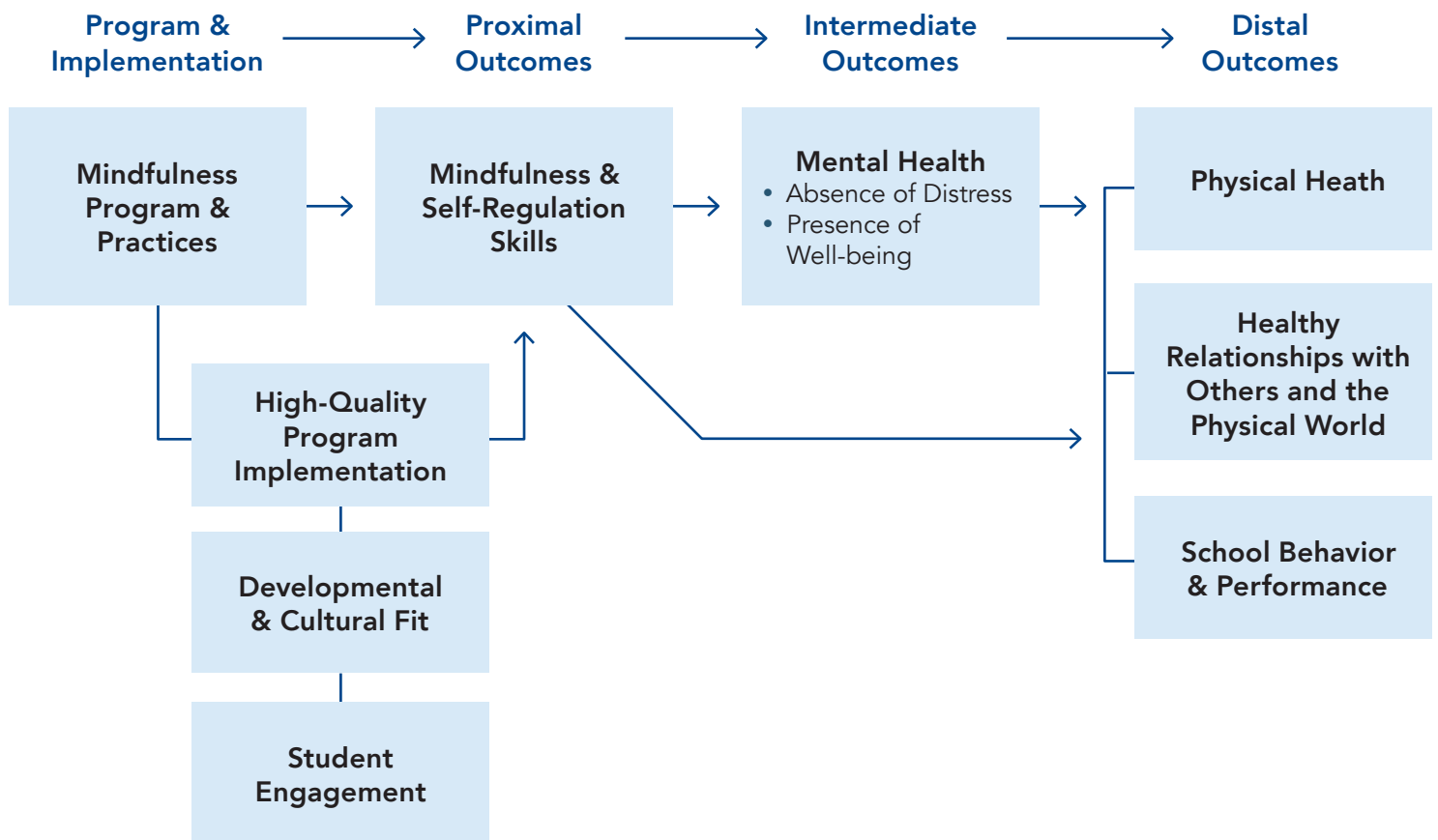
School Behavior and Performance

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



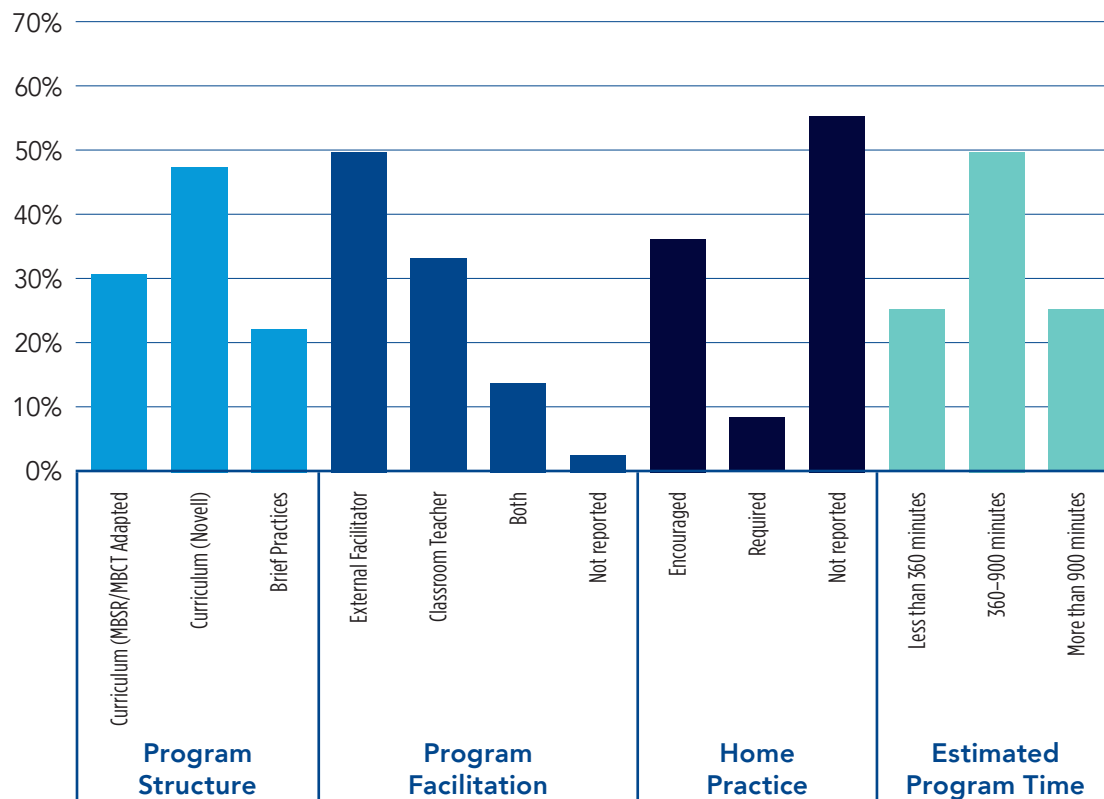
A Look at the Mindfulness Programs and Research Studies Reviewed for This Brief

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

Percentage of Programs



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

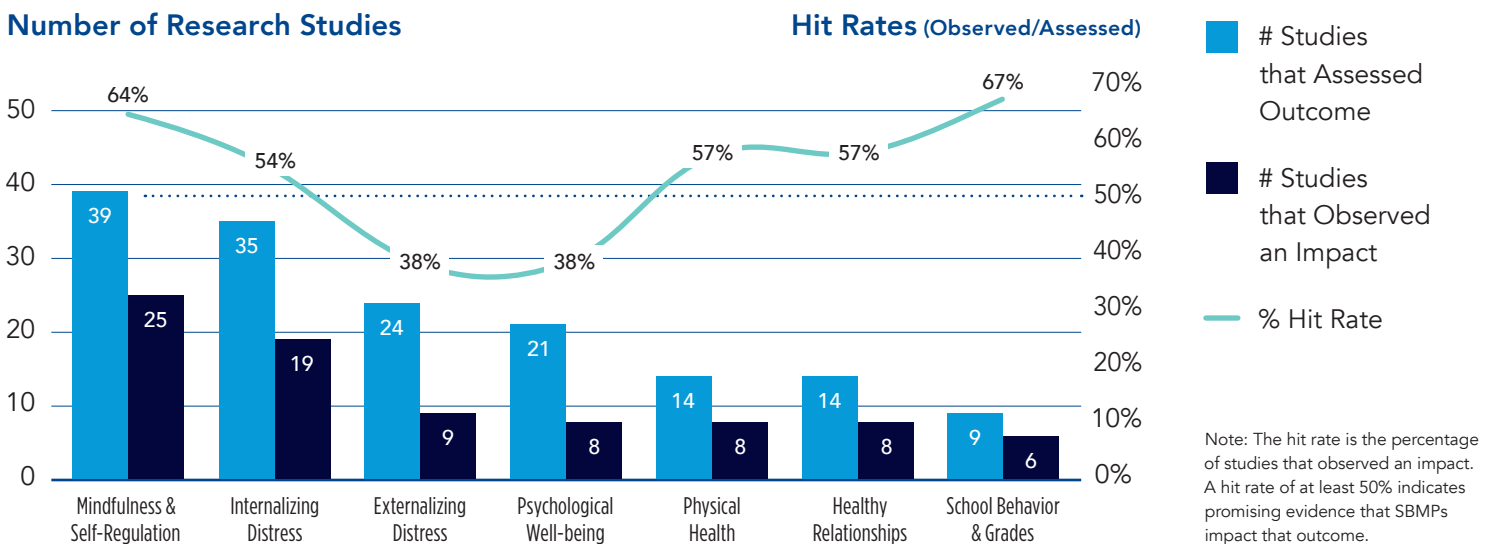
What did we learn about SBMP impacts on student outcomes in these studies? Figure 3 depicts the number of studies assessing each major student outcome^x. As the light blue bars in this figure show, and as discussed earlier in relation to our theory of change (Figure 1), the most frequently evaluated 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



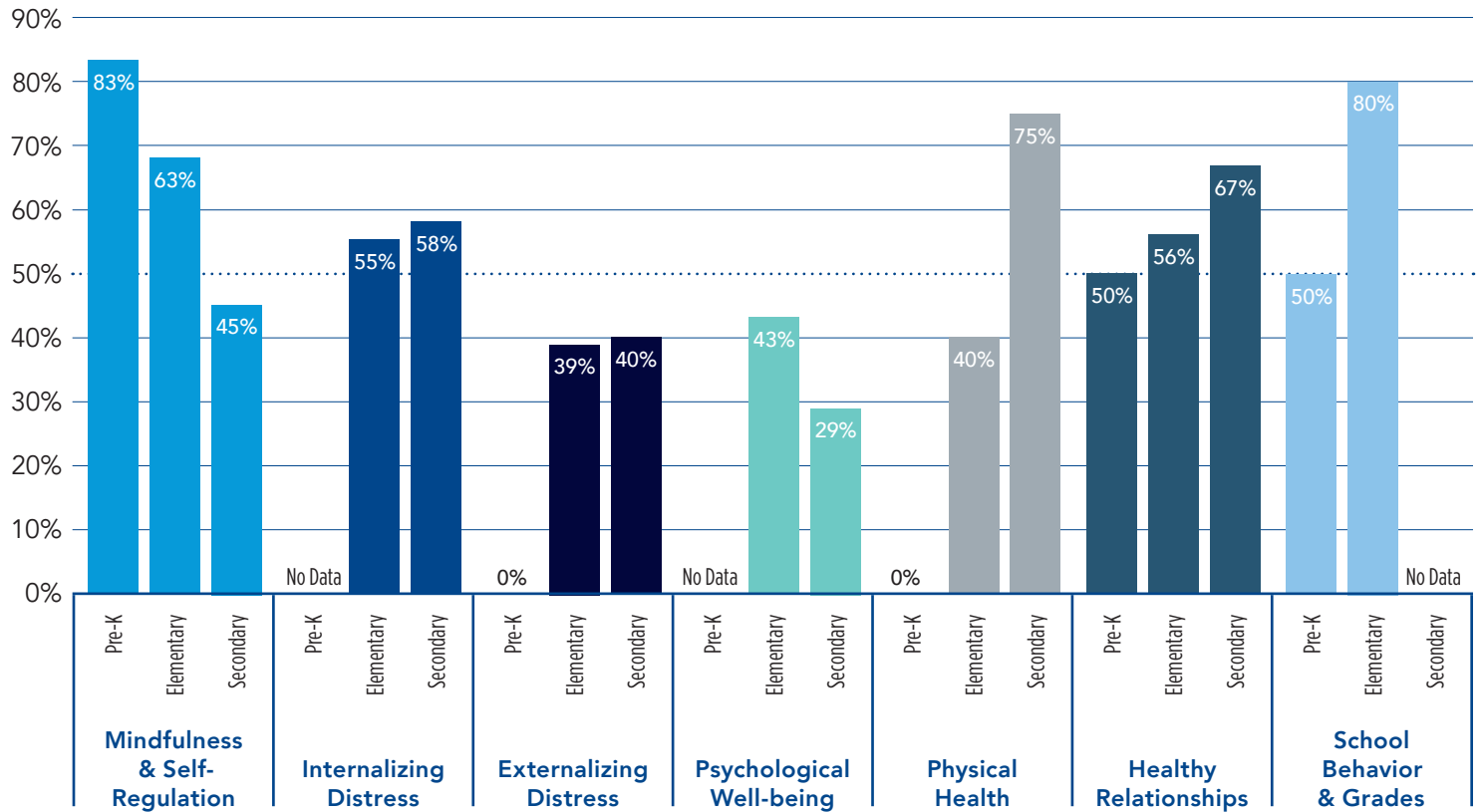
Conclusion 1. Mindfulness Programs Improve Students' Mindfulness and Self-Regulatory Skills

Mindfulness programs have a positive and significant impact^{xl} 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 Alexander⁸ 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

Hit Rates



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 $\frac{1}{2} = 0.50$ 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 SBMPs 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 [available online]).

These 54 studies evaluated 36 different mindfulness programs (see Supplementary Table 1 [available online]). 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 [available online], accounted for 46% of the studies ($n = 25$) in this review.

Note to Readers:

Supplementary Tables 1-3 (Programs in Reviewed Studies, Reviewed Studies and Student Outcomes, and School-Based Mindfulness Programs for Students and Number of Research Studies) may be downloaded at www.prevention.psu.edu/sel

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