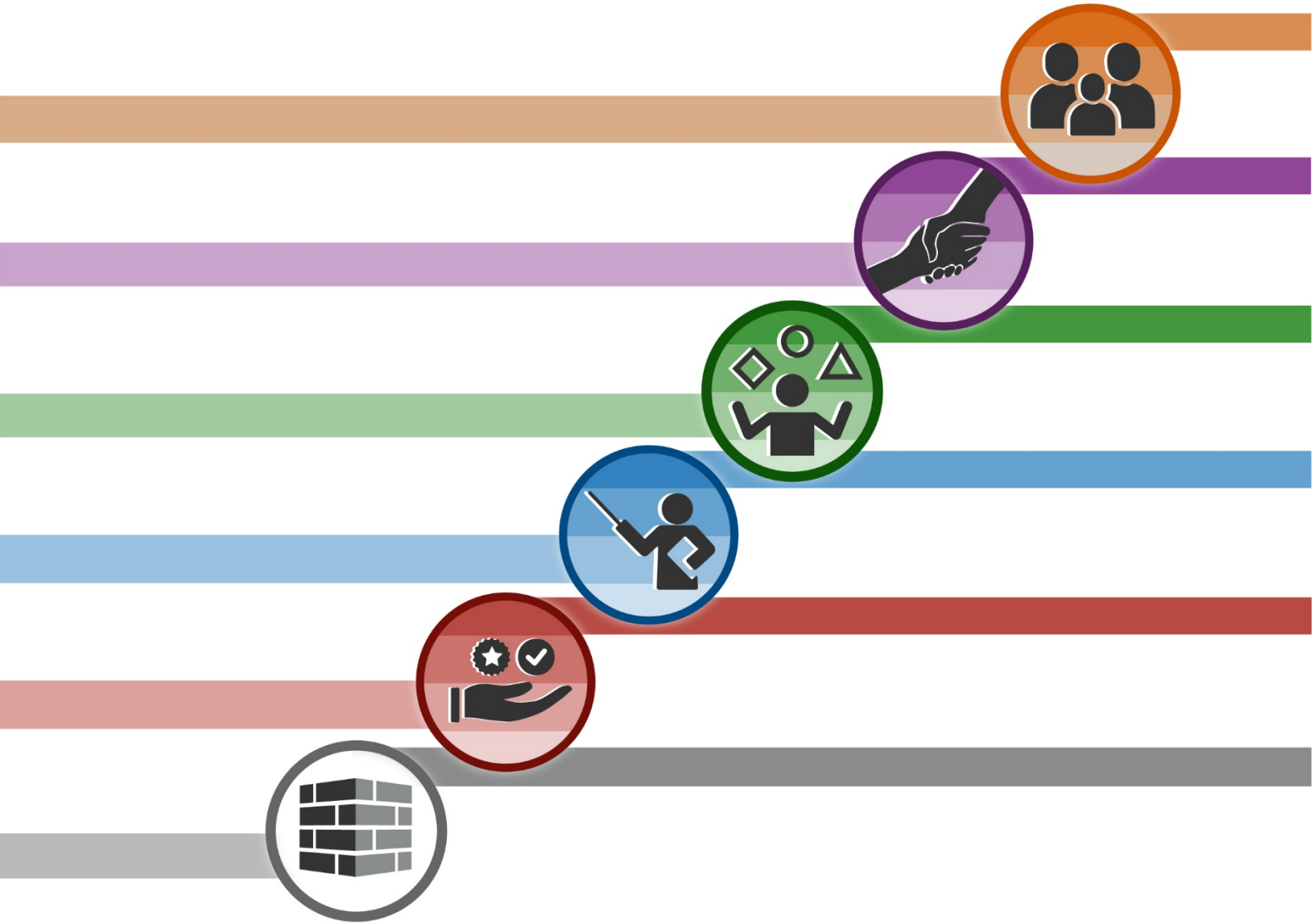# Developing Evidence-based Practice Guidelines for Youth Programs

Technical Report on the Core Components of Interventions that Address Self-Regulation

DEVELOPING EVIDENCE-BASED PRACTICE GUIDELINES FOR YOUTH PROGRAMS

Technical Report on the Core Components of Interventions that Address Self-Regulation

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Evidence for Program Improvement was established by The Assistant Secretary for Planning and Evaluation (ASPE) to develop evidence-based practice guidelines for youth programs using a core components approach. Our goal is to better understand the characteristics of effective programs for youth and share guidelines about how to make those programs more effective with those who design, support, and implement them.

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Executive Summary

This report describes and illustrates an approach to using evidence to improve the effectiveness of programs for children and youth. The approach capitalizes on the fact that across the many environments that offer youth programs (e.g., schools, community, mental health, public health), there is a great deal of well-controlled research available. Further, there is considerable variability in effectiveness across programs that can be reliably predicted from information reported in the research. Our goal is to better understand the sources of that variability so that we can uncover the characteristics of effective programs and share guidelines about how to make them more effective with those who design, support, and implement such programs.

Self-regulation is the ability to manage and control one's cognitions, emotions, and behaviors to enable goal-directed action (Murray et al., 2015). It is a foundational skill for healthy development. Self-regulation skills are linked to academic achievement and social competence in the classroom, and deficits in such skills are associated with academic underachievement and social and behavioral problems. There is an extensive array of programs that target self-regulation, including in most schools and communities in the U.S. Most programs targeting self-regulation have positive impacts on these skills but work still needs to be done to understand how best to target such programs for maximum impact on outcomes.

Background

Our approach to evidence-based practice applies a way of thinking about evidence that differs from the traditional "model program" approach, in which programs with the resources to undergo a rigorous evaluation find evidence of impact on a key outcome and are placed on a registry of evidence-based programs. The "core components" way of thinking considers both the programs themselves and aspects of the delivery format, dosage, implementation strategies, delivery personnel, and the like, that may also influence whether a program has positive impacts on youth outcomes. Drawing on a large meta-analytic database of research on youth programs, we identify a profile of program, participant, and implementation features that are empirically related to positive outcomes across the programs represented in the research. We call these program features *core components,* which we group into four domains of factors associated with: (1) intervention family or program content; (2) structure, format, and delivery of the program; (3) implementation strategies and challenges; and (4) characteristics of the program participants.

In this report, we focus on 385 universal, selected, and targeted prevention programs for children and youth in kindergarten through 12th grade, all of which provide evidence of program effects on self-regulation. Elementary school and early middle school aged children make up the majority of the evidence base but all grade levels from kindergarten through high school are included. The self-regulation outcomes are diverse; they index a variety of behaviors, including impulsiveness, anger control and expression, attention problems and hyperactivity, attentiveness, task orientation, persistence, planful, goal-directed behavior, and cognitive self-regulation and executive functioning. We group the programs into five intervention families based on their general approach to behavior change. Our core components analysis focuses on targeted prevention programs in all five intervention families and universal programs in the skill-building family. The five intervention families are defined as follows:

- Family Relations and Parenting Skills. Programs in this group aim to increase desirable positive behaviors and decrease undesirable negative behaviors among children and youth by improving parent-child relationships and/or promoting positive parenting behaviors.
- Relational Interventions. Programs in this group aim to influence desirable positive and undesirable negative behaviors and their precursors (e.g., attitudes, motivation, insight, perceptions, and behavioral intentions) in children and youth via positive and supportive relationships with others, including mentors or counselors, and possibly also with peers involved in the same program.
- Skill-building. Programs in this group aim to enhance youth interpersonal skills, improve youth responses to challenging interpersonal interactions with peers, teachers, and other adult authority figures, and train youth to

manage social interactions and/or their internal affective/executive processes and responses in ways that reduce the potential for conflict and externalizing behavior.

- **Behavior Management.** Programs in this group aim to shape or modify youth problem behavior and precursor/risk behaviors via teaching adults (such as parents and teachers) to manipulate rewards and punishments.
- **Academic and Educational Interventions.** Programs in this group aim to improve youth school performance, school engagement, and academically-oriented behavior but also report on self-regulation outcomes. Although self-regulation is not generally the primary focus, programs in this group may provide collateral benefits on youth self-regulation by promoting academic skills and school engagement.

Findings

Across the diverse programs in the dataset, the overall average program effect on self-regulation is positive, statistically significant, and represents meaningful effects on the self-regulation of the youth who participated in the programs ($\bar{g}$ = 0.27, p < .0001). This means that about 61 percent of youth program participants exhibited better outcomes (improved self-regulation; reductions in self-regulation challenges) than the average comparison group participant. In addition, the five intervention families each exhibit statistically significant impacts on self-regulation and most had sufficient variability to explore core components within the group. Our meta-regression analyses focused on discovering the core components that apply separately within each program approach.

Core Components

For each intervention family in our analysis, we identified core components that were meaningfully associated with program impacts on youth self-regulation. The core components we identified for the intervention families explain meaningful differences in program impacts and, thus, have good potential to inform practice guidelines. For each intervention family, we have identified actionable core components from models with reasonable fits to the data. The table below summarizes the findings from our meta-regression analyses. Each of the factors in the table will form the basis for a practice recommendation detailed in the associated practice guidelines (link to self-regulation practice guidelines).

Exhibit ES1.   Summary of Core Components for Each Intervention Family

	Program Content and Process	Program Structure	Implementation Quality
Skill-Building Programs	Programs that included social problem-solving skills training showed larger impacts.	Programs delivered in pull-out formats in school settings or in small groups in community settings exhibited larger impacts.	
Family Relations and Parenting Skills		One-on-one formatted programs exhibited larger program impacts. More frequent programs exhibited larger impacts.	Explicit mention of implementation problems was associated with smaller program impacts.
Relational Programs		More frequent programs exhibited larger impacts. Programs delivered by mental health professionals showed larger impacts.	Explicit mention of implementation problems was associated with smaller program impacts.
Skill-Building Programs	Programs with a focus on relaxation skills showed larger impacts. Programs that used modeling, role play, practice, and rehearsal showed larger impacts	Programs that were adapted to fit the context or that had flexible manuals that allowed them to be adaptable showed larger impacts	Provider supervision was associated with larger impacts. Programs with no mentioned implementation problems showed larger impacts.

	Program Content and Process	Program Structure	Implementation Quality
Behavior Management Programs	Programs with an explicit focus on appropriate classroom behavior showed larger impacts.	One-on-one formatted programs exhibited larger program impacts.	
Academic-Educational Programs	Programs with behavioral content and behavioral strategies showed larger impacts.	Programs delivered in pull-out formats in school settings showed larger program impacts.	Explicit mention of implementation problems was associated with smaller program impacts.

Conclusions

This report illustrates an application of a core components approach to evidence-based practice. It uses meta-analysis to empirically identify the program characteristics that are strongly associated with positive program effects. The companion report translates those **core components** into specific actionable guidance for improving practice in the field. The practice guidelines (link when available) are designed for use by provider agencies and are flexible and adaptable to a range of settings, may be more cost conscious, and permit providers more control over their own processes of improvement than the model programs approach.

The next phase for continuing this work would be to examine whether programs that use the guidelines to change their practices actually see better outcomes as a result. Indeed, the ultimate test of the validity of results such as these is not the statistical relationships we observe among the source studies, but demonstrations in the field that programs with the identified core components do in fact have better outcomes.

① Introduction

Self-regulation is the ability to manage and control one's cognitions, emotions, and behaviors to enable goal-directed action (Murray et al., 2015). It is a foundational skill for healthy development. Self-regulation skills are linked to academic achievement (Duncan, et al., 2007) and to social competence in the classroom (Denham et al., 2003; Eisenberg et al., 1997). Deficits in such skills, particularly those associated with attention skills and including attention deficit and hyperactivity disorder, are associated with academic underachievement, and social and behavioral problems (Rabiner, Coie, & CPPRG, 2000; Trzesniewski et al., 2006). As evidenced by numerous studies of interventions reporting positive impacts on self-regulation (e.g., Murray et al., 2019) as well as the evidence on which this report is based, self-regulation can be enhanced with intervention. Given the importance of self-regulation for youth development and adjustment to school and social situations, it is not surprising that there is an extensive array of programs that target self-regulation. Programs that promote self-regulation skills or that address attention and self-regulation deficits are available in most schools and communities in the U.S. Although programs targeting self-regulation are common, among the biggest challenges that teachers cite are youth behavior and helping students become more self-directed (e.g., edsys, 2019). As demonstrated below, most programs targeting self-regulation have positive impacts on these skills, but work still needs to be done to understand how best to target such programs for maximum impact on youth outcomes.

This report is part of a series of papers on using a **core components approach to evidence-based practice**. Our earlier technical papers describe additional detail about the rationale for the approach (Wilson, Jao, & Aloe, 2021; Wilson, Lipsey, Aloe, & Sahni, 2020); the technical papers were used to develop practice guidelines for programs targeting externalizing behavior problems and social competencies for youth (Francis, Wilson, Hyra, Weiss, & Norvell, 2021; Weiss, Wilson, Francis, Hyra, & Norvell, 2021).

Our approach to evidence-based practice applies a different way of thinking about evidence—a way that considers both the programs themselves and aspects of the delivery format, dosage, implementation strategies, delivery personnel, and the like, that may also influence whether a program has positive impacts on youth outcomes. Drawing on a large meta-analytic database of research on programs involving children and youth from kindergarten through 12th grade, we identify a profile of program, participant, and implementation features that are empirically related to positive outcomes across the programs represented in the research. We call these program features *core components* (Ferber et al., 2019). This report focuses on identifying such core components for programs that target youth self-regulation skills. A companion report (link when available) uses the results of the technical analyses presented here as the basis for practice guidelines that allow agencies and providers to assess how well their services stack up against what the evidence says are effective practices and can inform providers' efforts to improve services to align more closely with the evidence. Rather than expecting practitioners to consider model program evidence that may be disconnected from their work context, our core components approach can provide a pathway for providers to reflect on their current efforts in light of core components. Doing so might, in turn, guide their decisions around which practices to keep, which to adopt, and which to target for improvement.

This report focuses on a group of programs for children and youth in kindergarten through 12th grade. We use the terms *children* and *youth* somewhat interchangeably throughout the report for brevity; reference to a program for youth, therefore, should not be taken to imply a particular age range. The programs span the prevention continuum from universal programs to more targeted ones, all of which provide evidence of program effects on self-regulation. In the next section, we describe the meta-analytic database that serves as the evidence base and define the programs, participants, and implementation features included in the database. We then discuss the overall effectiveness of these youth programs for improving youth self-regulation as a lead-in to our analytic approach. Following that, we present the core components we identified from the meta-analysis. A series of appendices provides additional technical details about the meta-analytic database, our analytic approach, and sensitivity analyses.

② Characteristics of the Youth Programs

To identify core components, we use a group of youth programs from a large meta-analytic database that includes the results of hundreds of randomized and quasi-experimental studies of youth programs of relatively high quality. This database was developed with the goal of exploring the variability in intervention effects across studies of diverse programs for children and youth. For more information about the database, see Appendix A. The programs in the database are designed for children and youth in kindergarten through 12th grade and aim to have beneficial effects on many different outcome domains related to social and cognitive development, school performance, family and peer relations, antisocial behavior, and positive youth development generally. Within any of these domains, there is a great deal of variability in the effects of programs that can be reliably predicted from information reported in the studies. A better understanding of the sources of that variability could uncover the characteristics of effective programs, information that has the potential to be informative for those who design, support, and implement such programs about how to make them more effective.

The process of identifying core components begins with selecting an outcome domain and then collecting any program evaluation that reports program impacts in that domain from the larger database. Working backwards from an outcome domain, rather than selecting a set of programs for analysis, means that we can focus on a variety of program approaches, providers, participants, implementation practices, and settings, which all have the potential to improve the outcome of interest. This focus on any actionable feature of a service environment that might improve a high-priority outcome is intended to inform guidelines that are maximally useful to a range of audiences.

For this report, self-regulation is the outcome domain of interest. Our definition of self-regulation is based on Murray and colleagues' (2015) conceptualization and includes the skills and abilities needed to "manage cognition and emotion to enable goal-directed actions such as organizing behavior, controlling impulses, and solving problems constructively" (Murray et al., 2015, p. 5). Programs that target self-regulation are diverse and common in both school and community settings and range from universal programs delivered to children and youth without individually identified risk factors to targeted programs for young people already exhibiting difficulties with self-regulation, so the audience for practice guidelines in this area may be large.

From the larger database, we selected the 385 programs that report program impacts on self-regulation. The 385 programs consist of **universal** (i.e., programs targeted toward *youth with no particular risk factors*), **selected** (i.e., programs targeted toward *subpopulations broadly at risk due to such factors as community disadvantage or low achieving schools*), and **targeted** (i.e., programs for *individuals considered to be at risk of problems*) prevention programs. Elementary school and early middle school aged children make up the majority of the evidence base but all grade levels from kindergarten through high school are included. Many of the programs report program impacts on multiple measures of self-regulation. The analyses we report below make use of the multiple estimates of self-regulation we have available for a given program. The outcomes themselves are diverse; they index a variety of behaviors, including impulsiveness, anger control and expression, attention problems and hyperactivity, attentiveness, task orientation, persistence, planful, goal-directed behavior, and cognitive self-regulation and executive functioning. Most of the measures are collected via surveys or questionnaires reported by teachers, parents, or the children and youth themselves, but the database also includes performance measures which directly assess children's self-regulation skills and some observational outcomes. Appendix A includes additional descriptive detail about the outcomes and Appendix B provides information about how we selected and aggregated outcomes from the candidate studies.

The record for each study we selected for analysis provides estimates of program impacts (i.e., effect sizes) for the major study outcomes, along with extensive descriptive details about each study's program, providers, participants, and implementation activities. These descriptive data are our potential core components.

2.1 The Intervention Families

The programs include school-based, afterschool, and community-based programs that employ a wide range of intervention strategies, including those that directly target youth behavior and emotions (e.g., social problem-solving skills, anger management, self-regulation) and those focused on other targets such as parenting or academic difficulties that may also influence self-regulation. Using an inductive approach in which we carefully reviewed the descriptions of each program provided in the studies, we sorted the programs into eight broad categories representing different intervention families, most with several subcategories. Although we have grouped programs into mutually exclusive categories, many programs are multi-dimensional and often include elements from more than one of our intervention families. We aimed to place each program in the intervention family that best reflected its predominant content. To capture the multi-dimensionality of programs, our database also includes the configuration of individual elements that make up each program; we describe these elements in Appendix A and report the array of content and process elements present in each intervention family in Chapter 5. In addition, the intervention families can also be separated into universal, selected, and targeted programs based on the general prevention strategy applied.

The eight intervention families are:

Family Relations and Parenting Skills (42 studies: 4 universal, 11 selected, 27 targeted). Programs in this group aim to increase desirable positive behaviors and decrease undesirable negative behaviors among youth by improving parent-child relationships and/or promoting positive parenting behaviors. Family relations and parenting skills programs are intended to change youth behavior primarily by enhancing or improving parental or family influences on youth. This family of interventions includes three variations in our database:

- Programs with a family focus. Parent(s) *and* children receive services in these programs, with perhaps others as well (e.g., teachers); parent(s) and children may receive services together or separately. Content focuses on family functioning and parent-child relationships, but parenting skills may also be covered.
- Programs focused on parent training. Parent(s) receive services with child not involved or only minimally involved; others (e.g., teachers) may also be involved. Content focuses primarily on parenting skills and behaviors.
- Programs with a child coping focus. Children, and perhaps others (e.g., teachers), receive services, but not parents. Content focuses on strategies for supporting children coping with family issues, such as divorce.

Relational Interventions (38 studies: 7 universal, 3 selected, 28 targeted). Programs in this group aim to influence desirable positive and undesirable negative behaviors and their precursors (e.g., attitudes, motivation, insight, perceptions, and behavioral intentions) in children and youth via positive and supportive relationships with others, including mentors or counselors, and possibly also with peers involved in the same program. There are two variations of relational interventions in our database:

- Relatively open-ended or eclectic counseling/mentoring. Programs do not clearly follow a particular therapeutic orientation or process; content is often tailored to the needs of individual youth.
- Counseling/mentoring with a particular therapeutic orientation. Programs generally have a structure, guiding principles or goals, or issue that colors the process.

Skill-building (202 studies: 93 universal, 32 selected, 77 targeted). Programs in this group aim to enhance youth interpersonal skills, improve youth responses to challenging interpersonal interactions with peers, teachers, and other adult authority figures, and train youth to manage social interactions and/or their internal affective/executive processes and responses in ways that reduce the potential for conflict and externalizing behavior. Most programs involve training as well as the opportunity to practice learned skills. There are four variations in the database:

- Programs that emphasize both interpersonal skills and affective/executive processes or responses. Programs include interpersonal skills elements such as learning social problem-solving steps or identifying and diagnosing emotions or conflict situations and elements focused on controlling or managing affective/executive responses such as anger and impulsivity.
- Programs that emphasize mainly interpersonal skills. Programs focus largely on interpersonal behaviors and identifying and diagnosing emotions or conflict situations, with less emphasis on teaching meta-cognitive or executive skills.
- Programs that emphasize mainly affective/executive processes or responses. Programs focus mainly on training that addresses affective/executive processes or responses including anger, impulsivity, and the like that may inhibit or prevent positive social interactions.
- Programs that emphasize mindfulness. Programs focus on improving outcomes by teaching participants mindfulness tools for managing emotions and stress, and to better understand their thoughts and feelings. These interventions typically involve relaxation skills training (e.g., breathing exercises) but also incorporate self-awareness, attention to one's own thoughts and emotions, and/or attention/awareness of other people and the environment.

Behavior Management (31 studies: 4 universal, 3 selected, 24 targeted). Programs in this group aim to shape or modify youth problem behavior and precursor/risk behaviors via teaching adults (such as parents and teachers) how to manipulate rewards and punishments. Programs teach adults to employ a variety of mechanisms including incentives, disincentives, and behavioral contracting to modify youth problem behavior directly or modify the precursor behaviors that are risk factors for problem behavior.

Academic and Educational Interventions (46 studies: 20 universal, 7 selected, 19 targeted). Programs in this group aim to improve youth school performance, school engagement, and academically-oriented behavior but also report on self-regulation outcomes. Attention and self-regulation difficulties are associated with academic performance. Although not generally the primary focus, programs in this group may provide collateral benefits on youth self-regulation by promoting academic skills and school engagement. Many programs in this group also include elements focused on youth self-regulation. There are two variations in the database:

- Programs that focus on changing the school environment or structure. Programs include alternative schools, schools-within-schools, career academies, and the like. Many programs involve smaller class sizes, personalized interactions with teachers, and additional academic and behavioral supports for youth.
- Tutoring and remedial academic programs without a vocational component. Programs focus largely on academic supports for youth, often with goals of improved attendance and high school completion, though they may include other support services such as counseling

Three other groups of interventions included in the meta-analytic database reported impacts on self-regulation outcomes but were not included in the core components analysis. To conduct the core components analysis, we selected those intervention families with more than 10 studies, statistically significant positive effect sizes, and sufficient variability to explore components within the family. As noted below, these three intervention families have only a small number of

studies contributing to the evidence and/or exhibited little heterogeneity in treatment effects. These intervention families are:

Physical Activity (15 studies: 8 universal, 3 selected, 4 targeted). Programs in this group aim to promote self-regulation by providing opportunities for physical activity and movement. The rationale behind many physical activity programs is that physical activity in general can increase behavioral engagement and executive function, both important aspects of self-regulation.

Deterrence (2 studies). Programs in this group aim to change behavior via sanctions, intensive oversight or monitoring, consequences, or punishment. Manipulation of punishments or negative consequences, or illustrating potential negative consequences, is expected to modify behavior directly. Programs may include prosocial or positive youth development aspects, but the primary focus is on deterrence.

Other Programs (9 studies). The database also includes several programs that do not fit clearly into any of the above-mentioned intervention families. These programs included music education programs, school activity clubs, other types of clubs, and the like.

Programs in the deterrence, physical activity, and other programs intervention families were dropped from the core components analyses because too few programs were included in these categories and because there was little variability in the treatment effects. In addition, we also dropped all of the *selected* programs and all but one of the universal intervention families (skill-building) from the main core components analysis because there were either too few studies to analyze or the variability in treatment effects within the intervention families was not large enough to justify further analysis. We discuss variability in treatment effects and how we selected the intervention families to analyze in more detail in Chapters 3 and 4 below. Thus, five intervention families were carried through our analyses: *targeted* family relations and parenting skills interventions, *targeted* relational interventions, *universal and targeted* skill-building interventions, behavior management interventions, and academic and educational programs.

2.2   Other Program Features and Characteristics

In addition to the variations in overall intervention strategy, the programs in the database also vary in their staffing, format, resources, and program length, among other features. We have grouped these potential core components into four domains: program content, program structure, implementation strategies and challenges, and participant characteristics. Details about the studies included in the meta-analytic database and the protocol for coding the potential core components are included in Appendix A.

- **Program content**
  - Intervention family. Each program was coded into one of the intervention families we described above.
  - Program content and process elements. The content of each intervention was additionally described with a series of non-mutually exclusive elements. An intervention element is defined as a discrete, reliably identifiable technique or strategy, which (a) is used as part of a larger intervention or prevention program, (b) is intended to influence the behavior or well-being of a service recipient, and (c) cannot be further subdivided without being rendered inert.
    - o **Content elements** refer to the substance of an intervention. An element is a content element if it refers to specific knowledge, belief, skill, or action thought to influence behavior.
    - o **Process elements** refer to the active techniques or mechanisms through which a service provider delivers content elements and supports the behavior change process.

- **Program structure**
  - Program setting
    - Location: rural, suburban, urban, mixed; region of US
    - Service delivery setting: classroom, school, afterschool, community
  - Delivery format: individual, group, classroom
  - Program standardization
    - Lesson plans: specified number of sessions and session content vs. less structured; is transportable

- - Program modifications from manual
  - Delivery complexity: counts of formats, provider types, and settings
  - Program dosage
    - Duration in weeks from beginning to end
    - Frequency of sessions per week; number of sessions
  - Program personnel
    - Delivery personnel: researcher, specialist, teacher, layperson, etc.

- **Implementation strategies and challenges**
  - Provider training: training indicated or not
  - Provider supervision: evidence of supervision, consultation, or coaching of providers during the intervention
  - Implementation monitoring: whether implementation was monitored or not
  - Implementation challenges: whether implementation difficulties reported or not

- **Participant characteristics (see Box at right)**
  - Gender mix: male proportion of participant sample
  - Average age of participant sample
  - Age range of participant sample
  - Predominant race/ethnicity of sample
  - Presenting problem: Externalizing, internalizing, peer, family, school, etc.

Characteristics of the Youth Participants

AVERAGE AGE **10.6** years
about 5th grade;
range: preschool through high school

GENDER MIX OF SAMPLE

Female ← → Male

3%	30%	26%	30%	11%
All	Mostly	50-50	Mostly male	All

PREDOMINANT ETHNICITY OF SAMPLE

35%	24%	13%	3%	25%
White	Black	Latinx	Other minority	Mixed, none more than 60%

PRESENTING PROBLEM OF SAMPLE

44%	13%	43%
Externalizing behavior	Other presenting problem	General population

2.3   Characteristics of Study Methodology

In addition to the program and participant features, the meta-analytic database also includes details about the methods and research practices used in each study. These variables are not themselves potential core components that could inform practice because they do not represent substantive features of the program or its participants and are not actionable in practice settings. However, study methods and research practices are associated with program impacts in ways that may obscure statistical relationships that might be important for understanding program effects. For example, imagine that we observe smaller effects from research studies in which comparison groups receive some minimal level of service than from studies in which comparison groups receive no services at all. It makes sense that studies in which comparison groups receive more services might appear to have smaller impacts, but the contrast between intervention and comparison groups is not an actionable feature of a typical service environment. Thus, our analyses must address the influence of research methods, so that we can identify the actionable core components without them being obscured by methods. We conduct these analyses as sensitivity analyses and present the results in Appendix C.

3 | Effects of Youth Programs on Self-Regulation

Before identifying core components, we first look at the overall effects of youth programs on self-regulation and the distribution of those effects. Across the 327 programs and 1048 impact estimates in our analytic dataset, the overall average program effect on self-regulation is positive, statistically significant, and represents meaningful improvements in self-regulated behavior among youth who participated in the programs ($\bar{g}$ = 0.27, p < .0001). Expressed in percentage terms, **this average effect size of 0.27 means that about 61 percent of youth program participants exhibited better outcomes (improved self-regulation) than the average comparison group participant.**

In the results below, we will generally use a threshold of .10 effect size units as an indicator of a relatively meaningful difference, rather than relying solely on statistical significance. Model coefficients greater than .10 (or less than -.10) were, therefore, retained in the models whether they were statistically significant or not. The random effects models we use in all analyses are conservative. If we focus only on statistical significance from such models, we may overlook findings that are substantively meaningful. There is no standard way of judging whether an effect size difference is substantively important. It can depend on the particular context, the nature of the outcome, and the overall distribution of effects. We selected the .10 threshold because it represents about a third of the mean effect size of 0.27, or an approximately 4 percentage point difference in self-regulation. This may seem small, but taken in the context of the foundational nature of self-regulation for promoting positive youth development, we think a coefficient for a potential core component that represents a 4 percent change on youth behavior is meaningful in practical terms. More important for our purposes than the average treatment effect, however, is the considerable variability we observe in the effect sizes across studies.

3.1   Interpreting the Effect Size Variability

In the random effects meta-analysis models we use, several indicators provide different perspectives on the variability or heterogeneity among the effect sizes (Borenstein, Hedges, Higgins, & Rothstein, 2009). For the 327 programs and 1048 impacts we analyze here, there is evidence of substantial heterogeneity (Q = 2429, p <.05; I² = 58.86%; $\tau^2_{between}$ = .0504; τ^2_{within} = .0353). The Q statistic is an index for the total amount of study-to-study variation observed. A significant Q indicates that there is more study-to-study variation than can be explained by within-study sampling error. The I² statistic is derived from the Q and reflects the proportion of the total effect size variation that can be attributed to the heterogeneity between studies, and when there are multiple effect sizes per study, between the effect sizes within each study. I² values greater than 50 percent are generally considered to indicate sufficient effect size variability to warrant exploration of study characteristics associated with larger or smaller effects. Because we have more than one impact per study on self-regulation, we can separate the I² statistic into the portion effect size variation attributed to between study variation (34.63 percent) and the portion attributed to variation between effect sizes within each study (24.23 percent). We also have two τ^2 statistics, which estimate the between-study and within-study variances, respectively. Together, these variance estimates tell us about the range of effects we observe both within and between studies. The square root of $\tau^2_{between}$ is often used to describe the range of the between-study effects. For example, for a mean effect size of 0.27 and a $\tau_{between}$ of .2245 (the square root of our $\tau^2_{between}$ of .0504), we can expect that about 95 percent of the distribution of between-study effects will fall between -0.17 and 0.71 (i.e., 0.27 +/- 1.96*$\tau_{between}$), a rather large range. We note also that the amount of variability we observe within studies is not trivial. This is most likely due to the different ways that self-regulation was measured within studies. Some studies reported self-regulation outcomes from different informants (e.g., parents and teachers) and some studies reported different facets of self-regulation separately. These measurement differences could potentially result in different size impacts within the same study. The sensitivity analyses reported in Appendix C explore this possibility.

Although there is within studies variability in our data, there is sufficient variability between studies in observed outcomes to explore the influence of our potential core components for most intervention families, all of which are characteristics at the study level. That is, the variability we observe, mostly between studies, *motivates and provides the ideal circumstance for us to identify the factors that characterize the most effective programs.* Our next step is to identify those factors.

4   Analytic Approach to Identifying Core Components

We noted above that the meta-analytic database contains descriptive detail about the programs and participants involved in the research, which we categorized into four broad domains: program content, program structure, implementation strategies and challenges, and participant characteristics. This information, along with the observed variability in program impacts, is what permits us to identify core components across the range of studies reporting program impacts on self-regulation.

Specifically, we use a form of regression analysis tailored to meta-analytic data to identify the profile of program, participant, and implementation features that are empirically related to the effect sizes for self-regulation outcomes across the diverse program implementations represented in the studies in this body of research. This analysis estimates the relative contribution of each potential core component for predicting the largest program impacts. We use multi-level meta-regression models to account for the dependencies that result when studies are permitted to contribute more than one effect size to an analysis (Konstantopoulos, 2011; Viechtbauer, 2010).

As with any multiple regression analysis, correlated independent variables (or moderators) can obscure the relationship of any one independent variable with the outcome. That is, many of the potential core components in the meta-analytic database are not just related to program effectiveness; they are also related to each other. Many of the potential core components do co-occur in the programs in the database. Our analytic strategy is, therefore, designed to isolate the independent influence of each potential core component as much as possible. For the analysis, we sought to select variables that were not strongly correlated with each other and used a variable selection strategy designed for smaller datasets. In addition, we performed the analyses separately for each intervention family to better isolate the core components that might interact with the intervention families if all programs were analyzed together. Separating programs in this way helps us better disentangle the core components that are related to each other. This separation also means that the practice guidelines we develop from the analysis may need to be tailored to the intervention families so that practitioners can more easily find recommendations relevant for the kinds of programs they implement.

In the final stage of our analysis, we explore whether any methodological confounds exist and whether these confounds might offer alternative explanations for the substantive findings. These analyses are presented in Appendix C. Additional technical details about our analytic approach, including our procedures for weighting, estimating models, handling missing data, and the process for selecting potential core components for analysis, are presented in Appendix B.

4.1   Limitations of the Analytic Approach

All of the analyses we report in this paper are exploratory and correlational. Even though individual impact estimates from the studies, especially those that use randomized designs, are causal estimates, findings from meta-regression analyses are not. Our analyses examine the empirical relationships between potential core components and observed findings, but that does not mean that a particular variable or core component directly caused the findings we observe. **That is, any core component we identify should not be thought of as having a direct causal impact on self-regulation, but rather as a factor that practitioners should consider.** This is not specifically a limitation of the analytic approach, but it is important to communicate this complexity. In addition, although we present significance tests for our findings, we are more interested in the magnitude of the regression coefficients than in their statistical significance. The random effects models we use to estimate our models are rather conservative (as is appropriate for a diverse dataset like ours), but that means we are less likely to find statistical significance, even when the relationships are substantively meaningful. Our analyses are intended to identify the features that characterize the most effective programs as a way to inform practice, not to make causal statements about the effects of any particular variable or set of variables. In the next section, we separate the programs into intervention families and explore the core components that are important for each family.

5 Core Components for Different Intervention Families

For this phase of our analysis, we separated the diverse programs that aim to promote self-regulation into the intervention families with sufficient evidence to analyze. We hypothesized that programs characterized by different approaches to changing behavior might exhibit different configurations of core components. In addition, we expect that practice guidelines might be more useful for practitioners if the recommendations they provide are tailored to a specific intervention family.

Exhibit 1 shows the mean effect sizes and heterogeneity statistics for all intervention families separated by prevention strategy. For universal prevention programs, only the relational programs and skill-building programs demonstrated statistically significant impacts on self-regulation. In general, the mean effect sizes for the universal programs are smaller in magnitude than the impacts for the selected and targeted programs. We would expect universal programs to have smaller impacts than selected and targeted programs given that the participants in universal programs are not characterized by particular risk factors or issues. For the selected prevention programs, we see generally larger average effect sizes and several intervention families exhibit statistically significant positive impacts. For the targeted programs, all intervention families except the physical activity programs have statistically significant positive impacts on our self-regulation outcomes.

Exhibit 1.   Mean Effect Sizes and Heterogeneity Statistics for the Intervention Families

	k	N	Mean Effect Size	se	LCI	UCI	τ^2 (between)	τ^2 (within)	Q	I^2 (total)	I^2 (between)	I^2 (within)
Universal Prevention Programs												
Family Relations & Parenting Skills	4	6	0.06	0.06	-0.07	0.18	0.00	0.004	6	15.5	0.0	15.5
Relational Interventions	7	13	0.41*	0.16	0.10	0.72	0.12	0.00	25*	65.5	65.5	0.0
Skill-Building	93	247	0.20*	0.03	0.15	0.26	0.01	0.05	490*	52.8	10.3	42.6
Behavior Management	4	8	0.05	0.06	-0.08	0.17	0.00	0.00	2	0.0	0.0	0.0
Academic and Educational	20	47	0.08	0.05	-0.02	0.18	0.02	0.00	54	25.7	25.7	0.0
Physical Activity	8	35	0.09	0.07	-0.05	0.23	0.01	0.00	32	24.9	24.9	0.0
Selected Prevention Programs												
Family Relations & Parenting Skills	11	16	0.18*	0.07	0.04	0.31	0.02	0.00	21	26.1	26.1	0.0
Relational Interventions	3	5	0.48	0.33	-0.17	1.13	0.31	0.00	29*	85.4	85.4	0.0
Skill-Building	32	99	0.11*	0.04	0.02	0.20	0.02	0.00	105*	25.7	25.7	0.0
Behavior Management	3	5	0.40	0.60	-0.77	1.58	1.03	0.00	29*	92.5	92.5	0.0
Academic and Educational	7	10	0.36*	0.15	0.07	0.64	0.08	0.00	17	56.5	56.5	0.0
Physical Activity	3	7	0.36*	0.16	0.05	0.67	0.04	0.00	4	33.2	33.2	0.0
Targeted Prevention Programs												
Family Relations & Parenting Skills	27	89	0.45*	0.07	0.31	0.58	0.06	0.11	427*	79.2	26.9	52.2
Relational Interventions	28	50	0.38*	0.07	0.24	0.52	0.07	0.00	92*	57.4	56.8	0.6
Skill-Building	77	382	0.28*	0.04	0.21	0.36	0.07	0.02	749*	55.0	44.9	10.1
Behavior Management	24	59	0.39*	0.07	0.26	0.52	0.05	0.00	96*	41.1	41.1	0.0
Academic and Educational	19	65	0.38*	0.06	0.26	0.49	0.01	0.09	182*	66.4	8.8	57.6
Physical Activity	4	35	0.20	0.14	-0.08	0.47	0.04	0.01	40	27.0	20.7	6.3

Note. k = number of studies; n= number of effect sizes; se = standard error of the estimate; LCI and UCI are the lower and upper 95% confidence intervals; the τ^2 estimates reflect the between- and within-studies variance; I^2 estimates the proportion of total variance due to heterogeneity; the total, between-studies, and within-studies estimates are shown; Q is an index of the total amount of study-to-study variation.
*p<.05

In order to explore components within an intervention family, we selected those intervention families with more than 10 studies, statistically significant positive effect sizes, and sufficient variability to explore components within the family, as evidenced by the statistically significant Q-statistics, and relatively large I^2 and τ^2 values. Some intervention families have only a small number of studies contributing to the evidence and/or exhibited little heterogeneity in treatment effects – these include all of the universal intervention families except skill-building, all of the selected programs, and physical activity in the targeted programs group (shown in italics). These intervention families have non-significant Q-statistics or smaller I^2 and τ^2 values. Only those intervention families with sufficient variability were carried forward to the meta-regression analysis for identifying core components.

Within the three prevention strategy groupings, the confidence intervals overlap for many intervention families suggesting that the different types of interventions generally have similar impacts on self-regulation (Exhibit 2). However, the differences in the magnitude of the average effects across the intervention families are large enough that they might obscure the relationships of other core components with the outcomes. Thus, there are both practical reasons (i.e., practice guidelines might be more useful if separated by intervention family) and empirical reasons (i.e., differences in average effects between programs might obscure the relationships of moderators to the outcome) to explore the core components separately within each intervention family.

Exhibit 2.   Mean Effect Sizes and Confidence Intervals for the Intervention Families by Prevention Strategy

For each intervention family, we began our exploratory analysis by examining the descriptive statistics for the potential core components in four domains: implementation strategies and challenges, program content, program structure, and participant characteristics. The specific configurations of core components were tailored to the individual intervention family because not all features were present or had sufficient variability within a family.

- Implementation strategies and challenges: provider training or supervision and indications of problems with implementation
- Program content: intervention sub-type and the most common content and process elements in the intervention family
- Program structure: duration of intervention and frequency of treatment; individualized vs. group; classroom-based, pullout, community-based; delivery personnel; use of lesson plans; delivery complexity, as indexed by the number of delivery formats, providers, and settings used to implement the program
- Participant characteristics: age, grade level, presenting problem, and gender

We selected potential core components from the set of available variables using several strategies. First, we examined the bivariate relationships of each potential core component with effect size; those with near zero relationships were not explored further. In addition, we used a form of random forests analysis tailored to meta-analytic data to assist with variable selection. Random forests analysis is a technique for variable selection that helps identify potentially influential variables for analysis while taking into consideration the interrelationships and interactions among those variables (Hapfelmeier & Ulm, 2013; van Lissa, 2018). Variables correlated with effect size that were not highly skewed (i.e., had only a small number of programs in the group exhibiting the feature) were entered into a random forests analysis. Those that were identified as important in that analysis were explored in our meta-regression models. To arrive at the final meta-regression models, we removed variables selectively from the meta-regression models that did not have meaningful independent relationships with the effect sizes. As we mentioned above, we chose .10 effect size units as the threshold for a meaningful difference. Thus, binary core components were considered to have a meaningful relationship with effect sizes if their independent contribution to predicting effect sizes (the regression coefficients, or bs, in the models) was 0.10 or larger. Variables that were not binary were standardized for analysis. More details about the specifics of our analysis are included in Appendix B.

Weighted bivariate correlations between most potential core components and effect sizes for the individual intervention families are shown in the respective chapters for each intervention family below. The array of process and content elements present in each intervention family and the correlations of those elements with effect size are shown in Exhibits 3 and 4 below. More detail about how we defined each process and content element is included in Appendix A. Content and process elements present for at least 10 percent of the studies in the intervention family (or at least 5 studies for smaller intervention families) with weighted correlations larger than 0.10 (or smaller than -0.10) are highlighted in bold and were included in the random forests analysis.

Although we explore the influence of the content and process elements in the analyses below, the array of elements present in each intervention family shown in Exhibits 3 and 4 is interesting in its own right. The diversity of content within programs and the diversity of process strategies used to deliver that content is striking. Small datasets prevent us from examining these elements in detail in the quantitative analysis, but future work may allow us to explore program content and process more deeply.

Exhibit 3. Content Elements and Correlations with Effect Size for Selected Intervention Families

	Universal Prevention Programs		Targeted Prevention Programs								
	Skill-Building (k=93)		Family Relations and Parenting (k=27)		Relational (k=28)		Skill-Building (k=77)		Behavior Management (k=24)		Academic and Educational (k=19)	
	k (%)	r_{es}	k (%)	r_{es}	k (%)	r_{es}	k (%)	r_{es}	k (%)	r_{es}	k (%)	r_{es}
Behavioral Content												
Relaxation skills training	35 (38%)	0.01	--	--	--	--	**15 (20%)**	**0.23**	--	--	1 (5%)	0.08
Appropriate classroom behavior	10 (11%)	0.01	**5 (19%)**	**-0.11**	4 (14%)	-0.23	9 (12%)	-0.03	**20 (83%)**	**0.50**	3 (16%)	0.10
Cognitive Content												
Problem solving sequence	29 (31%)	0.02	5 (19%)	-0.03	1 (4%)	-0.34	24 (31%)	-0.06	2 (8%)	0.13	3 (16%)	-0.13
Empathy	19 (20%)	0.00	--	--	2 (7%)	0.22	9 (12%)	-0.03	1 (4%)	0.07	--	--
Attribution retraining, coping skills	21 (23%)	-0.03	1 (4%)	0.08	4 (14%)	0.19	5 (7%)	-0.05	1 (4%)	0.27	1 (5%)	0.08
Moral development training	1 (1%)	-0.07	--	--	--	--	1 (1%)	-0.02	--	--	--	--
Self-statements for inhibition	10 (11%)	0.10	--	--	2 (7%)	0.31	11 (14%)	0.06	**6 (25%)**	**0.14**	1 (5%)	0.00
Executive functioning skills	12 (13%)	-0.05	1 (4%)	-0.02	1 (4%)	0.24	12 (16%)	-0.04	1 (4%)	0.27	**8 (42%)**	**0.14**
Interpersonal, Social Skills												
Interpersonal, social skills	37 (40%)	-0.01	11 (41%)	-0.07	11 (39%)	-0.04	20 (26%)	-0.03	4 (17%)	-0.27	**5 (26%)**	**-0.14**
Conflict resolution, social problem solving	17 (18%)	-0.01	3 (11%)	-0.09	1 (4%)	-0.28	6 (8%)	0.02	--	--	3 (16%)	-0.07
Assertive communication skills	9 (10%)	0.01	3 (11%)	-0.09		--	10 (13%)	0.05	--	--	--	--
Identifying, understanding feelings	44 (47%)	-0.08	2 (7%)	-0.07	**8 (29%)**	**-0.12**	19 (25%)	-0.08	--	--	1 (5%)	0.08
Personal development												
Personal development	26 (28%)	-0.07	6 (22%)	-0.09	**16 (57%)**	**0.26**	15 (19%)	0.00	3 (13%)	-0.48	10 (53%)	-0.09
Trusting relationship with caring adult	--	--	2 (7%)	0.02	**9 (32%)**	**-0.39**	1 (1%)	-0.06	--	--	2 (11%)	-0.18
General personal or social support	--	--	1 (4%)	-0.21	**5 (18%)**	**0.25**	--	--	--	--	--	--
Anger management												
Behavioral coping skills for anger	10 (11%)	-0.03	2 (7%)	-0.07	1 (4%)	-0.28	12 (16%)	0.00	--	--	--	--
Problem solving sequence for anger	10 (11%)	0.04	--	--	1 (4%)	-0.28	20 (26%)	0.00	--	--	--	--
Attribution retraining for anger	1 (1%)	0.00	--	--	--	--	2 (3%)	-0.07	--	--	--	--
Self-statements to inhibit anger	2 (2%)	-0.01	--	--	--	--	19 (25%)	0.06	1 (4%)	-0.49	--	--
Angry behavior cycle	2 (2%)	0.03	--	--	1 (4%)	-0.28	**15 (20%)**	**0.17**	--	--	--	--
Content for caregivers and families												
Parenting skills	2 (2%)	0.07	25 (93%)	0.06	2 (7%)	0.20	14 (18%)	-0.08	3 (13%)	-0.37	**5 (26%)**	**0.16**
Parent functioning, well-being	--	--	**8 (30%)**	**-0.17**	--	--	2 (3%)	-0.09	--	--	1 (5%)	-0.16
Social support	--	--	2 (7%)	-0.16	1 (4%)	-0.34	1 (1%)	-0.01	--	--	--	--
Family communication skills	3 (3%)	0.05	10 (37%)	0.00	2 (7%)	-0.25	7 (9%)	-0.09	--	--	2 (11%)	-0.12
Engagement with child's school	1 (1%)	-0.04	**9 (33%)**	**0.21**	1 (4%)	0.24	3 (4%)	-0.13	2 (8%)	-0.02	3 (16%)	-0.03
Information provision for families	--	--	**6 (22%)**	**0.12**	1 (4%)	0.24	3 (4%)	-0.02	--	--	1 (5%)	-0.07
Academic, educational	2 (2%)	-0.06	5 (19%)	0.02	**6 (21%)**	**-0.41**	7 (9%)	-0.07	**7 (29%)**	**-0.37**	18 (95%)	-0.08
School structure	1 (1%)	0.03	--	--	--	--	--	--	1 (4%)	0.27	--	--
Service learning	--	--	1 (4%)	0.09	1 (4%)	0.22	--	--	--	--	--	--
Self-sufficiency skills	--	--	--	--	--	--	--	--	--	--	--	--
Health education and promotion	4 (4%)	0.03	--	--	2 (7%)	0.09	--	--	--	--	--	--
Provide basic needs	--	--	2 (7%)	0.18	1 (4%)	-0.34	1 (1%)	0.01	--	--	--	--
Recreational	4 (4%)	0.00	1 (4%)	0.00	6 (21%)	0.07	2 (3%)	-0.17	--	--	4 (21%)	-0.15
Employment, vocational	--	--	--	--	3 (11%)	-0.04	--	--	--	--	--	--
Case management, service brokerage	--	--	1 (4%)	-0.13	2 (7%)	-0.07	3 (4%)	-0.18	1 (4%)	-0.01	1 (5%)	-0.16
Parenting skills for youth	--	--	--	--	--	--	--	--	--	--	--	--
Violence and/or drug use education	2 (2%)	0.03	--	--	2 (7%)	0.09	--	--	--	--	--	--

Exhibit 4. Process Elements and Correlations with Effect Size for Selected Intervention Families

	Universal Prevention Programs		Targeted Prevention Programs									
	Skill-Building (k=93)		Family Relations and Parenting (k=27)		Relational (k=28)		Skill-Building (k=77)		Behavior Management (k=24)		Academic and Educational (k=19)	
	k (%)	r_{es}	k (%)	r_{es}	k (%)	r_{es}	k (%)	r_{es}	k (%)	r_{es}	k (%)	r_{es}
Engagement Strategies												
Behavioral strategies	3 (3%)	0.11	2 (7%)	0.10	2 (7%)	0.16	12 (16%)	-0.03	--	--	3 (16%)	0.30
Removing barriers	--	--	7 (26%)	-0.02	1 (4%)	0.24	2 (3%)	0.21	--	--	1 (5%)	-0.16
Reminders	--	--	--	--	--	--	--	--	1 (4%)	-0.16	--	--
Other engagement strategies	1 (1%)	-0.03	2 (7%)	0.06	--	--	--	--	1 (4%)	-0.01	--	--
Instructional Strategies												
Lecture, instruction, seminar	62 (67%)	-0.07	18 (67%)	0.04	6 (21%)	-0.08	42 (55%)	0.01	**8 (33%)**	**-0.51**	13 (68%)	-0.09
Group discussion, interaction	69 (74%)	-0.02	14 (52%)	-0.09	**5 (18%)**	**0.36**	**41 (53%)**	**-0.13**	1 (4%)	-0.16	**7 (37%)**	**-0.30**
Modeling (live)	**26 (28%)**	-0.07	5 (19%)	-0.09	3 (11%)	0.29	30 (39%)	0.05	2 (8%)	0.08	3 (16%)	-0.19
Modeling (video)	**18 (19%)**	0.04	7 (26%)	-0.05	--	--	15 (20%)	-0.06	--	--	1 (5%)	-0.07
Role play, rehearsal, trying new skills	54 (58%)	-0.06	**16 (59%)**	**-0.15**	4 (14%)	0.15	**56 (72%)**	**0.17**	3 (13%)	0.01	**5 (26%)**	**-0.17**
Experiential learning	26 (28%)	0.05	1 (4%)	0.04	3 (11%)	0.02	5 (7%)	-0.12	--	--	1 (5%)	-0.10
Self-evaluation, self-monitoring	**18 (19%)**	0.09	--		2 (7%)	0.00	7 (9%)	-0.02	7 (29%)	-0.09	8 (42%)	0.04
Self-directed learning	4 (4%)	0.09	1 (4%)	-0.13	--	--	**13 (17%)**	**-0.13**	--	--	2 (11%)	0.12
Behavioral Strategies												
Positive reinforcement	12 (13%)	-0.06	**11 (41%)**	**0.11**	2 (7%)	0.03	22 (29%)	-0.08	22 (92%)	-0.13	9 (47%)	-0.05
Negative reinforcement	1 (1%)	-0.03	**5 (19%)**	**0.29**	1 (4%)	-0.14	8 (10%)	-0.05	**11 (46%)**	**-0.20**	2 (11%)	-0.08
Counseling Strategies												
Reality therapy	--	--	1 (4%)	0.08	3 (11%)	0.03	--	--	--	--	--	--
Individual counseling	4 (4%)	0.13	3 (11%)	0.17	**11 (39%)**	**0.23**	5 (7%)	0.06	2 (8%)	0.03	1 (5%)	-0.07
Motivational interviewing	--	--	1 (4%)	-0.05	--	--	--	--	--	--	1 (5%)	0.00
Group counseling	--	--	2 (7%)	0.02	**10 (36%)**	**-0.28**	8 (10%)	0.22	--	--	1 (5%)	0.08
Family counseling	--	--	9 (33%)	-0.04	2 (7%)	-0.07	2 (3%)	-0.02	--	--	1 (5%)	0.00
Mediation	--	--	--	--	--	--	--	--	--	--	--	--
Support Groups	--	--	1 (4%)	-0.05	1 (4%)	-0.34	2 (3%)	-0.07	--	--	--	--
Mentor Provided	--	--	--		**7 (25%)**	**-0.25**	--	--	--	--	2 (11%)	-0.18
Peer-Driven Strategies												
Peer mediation – recipient	--	--	--	--	--	--	--	--	--	--	--	--
Peer mediation – service as mediator	2 (2%)	0.03	--	--	--	--	--	--	--	--	--	--
Peer mentoring, counseling – recipient	--	--	--	--	1 (4%)	-0.03	1 (1%)	0.07	--	--	1 (5%)	-0.16
Peer mentoring – service as	--	--	--	--	--	--	--	--	--	--	--	--
Peer tutoring, education – service as	--	--	--	--	--	--	--	--	--	--	1 (5%)	0.18
Peer tutoring, education – recipient	--	--	--	--	--	--	--	--	--	--	1 (5%)	0.18
Positive peer culture	2 (2%)	-0.03	1 (4%)	0.00	--	--	1 (1%)	-0.02	--	--	--	--
Supporting Change												
Homework	21 (23%)	-0.02	20 (74%)	0.03	3 (11%)	0.04	**22 (29%)**	**0.17**	--	--	3 (16%)	-0.16
Referrals to other services	--	--	1 (4%)	-0.13	2 (7%)	0.21	1 (1%)	0.06	1 (4%)	-0.01	2 (11%)	-0.12
Program integration	14 (15%)	-0.04	7 (26%)	0.00	3 (11%)	0.04	13 (17%)	0.04	**5 (21%)**	**-0.28**	10 (53%)	0.07

5.1 Core Components of Universal Skill-building Interventions

The key features of the 93 studies of universal skill-building interventions are shown in Exhibit 5. Their content and process elements are shown, respectively, in Exhibits 3 and 4. The programs in this intervention family are largely delivered in regular classroom settings and most are in elementary schools. Most programs are lesson plan-based. Programs averaged about 24 weeks in duration and the modal frequency of service delivery was once or twice per week. Teachers were delivery personnel in 44 percent of the programs, but other types of delivery personnel were also evident.

Exhibit 5.   Characteristics of Universal Skill-building Interventions (k=93)

	Frequency (%) Mean (sd)	Correlation with Effect Size		Frequency (%) Mean (sd)	Correlation with Effect Size
Implementation Quality			**Primary Setting**		
Explicit or suggested problems	27 (29%)	-0.10	Regular classroom	70 (75%)	-0.14
No problems or no mention of problems	66 (71%)	0.10	Resource room	12 (13%)	0.09
Implementation monitoring=Yes	56 (60%)	-0.07	Afterschool	2 (2%)	-0.05
Delivery Complexity			Outpatient	3 (3%)	0.00
Number of different formats	1.2 (0.6)	-0.05	All others	6 (7%)	0.13
Number of different provider types	1.3 (0.5)	-0.06	**Program Documentation**		
Number of different settings	1.1 (0.3)	-0.01	Lesson plan-based program	76 (82%)	-0.11
Provider Training and Supervision			No lesson plans, content-oriented	14 (15%)	0.09
Provider training=Yes	67 (72%)	-0.09	Combination	3 (3%)	0.05
Provider supervision=Yes	43 (46%)	-0.01	**Program Modifications**		
Dosage			Modified original program	25 (27%)	-0.01
Duration (weeks)	24.0 (41.5)	-0.12	No, delivered as designed	68 (73%)	0.01
Number of sessions	44.0 (80.7)	-0.15	**Transportability**		
Frequency (sessions/week)		0.09	Program is transportable	87 (94%)	-0.15
Less than weekly	2 (2%)		**Participant Characteristics**		
1-2x/week	41 (44%)		Average age	10.7 (3.0)	0.01
2-3x/week	17 (18%)		*Grade Level*		
3-4x/week	18 (19%)		Elementary school	57 (61%)	-0.01
5x/week, daily	15 (16%)		Middle school	18 (19%)	0.01
Primary Location			High school	15 (16%)	0.02
School	85 (91%)	-0.15	Mixed grade levels	3 (3%)	-0.02
Community	8 (9%)	0.15	*Gender Mix*		0.11
Alternative school	0 (0%)		<50% male	55 (59%)	
Primary Format			50-60% male	33 (35%)	
One-on-one	6 (6%)	0.15	>60% male	2 (2%)	
Group (not classroom)	14 (15%)	0.07	>95% male	3 (3%)	
Student group (classroom)	73 (79%)	-0.12	*Predominant Race/Ethnicity*		
Delivery Personnel			White	39 (42%)	
Researcher	27 (29%)	0.08	Black	12 (13%)	
Teachers	41 (44%)	-0.12	Latinx	16 (17%)	
Program/site staff, specialists	15 (16%)	0.07	Mixed, none more than 60%	26 (28%)	
All others	10 (11%)	0.01			

	Frequency (%) Mean (sd)	Correlation with Effect Size		Frequency (%) Mean (sd)	Correlation with Effect Size
Intervention Family Subcategory					
Interpersonal + affective/executive	48 (52%)	-0.06			
Interpersonal	6 (7%)	-0.01			
Affective/executive	12 (13%)	0.08			
Mindfulness	27 (29%)	0.02			

Note. k=number of studies. The correlations shown in the table are bivariate inverse variance weighted correlations between the potential effectiveness factor and the effect size. For binary variables (e.g., implementation quality) the correlation is reported for only one direction. For categorical variables, the correlations reported are for the category shown with all other values on the variable in the reference category. The correlations are reported only for variables or categories within categorical variables with at least 10 cases in the category.

The meta-regression model for the universal and selected skill-building programs is shown in Exhibit 6. Two core components were identified. The coefficients in the regression model represent the amount of change on the dependent variable (the effect size) associated with a one unit change on the core component.[1] For example, **programs delivered in a pull-out format in schools or community settings show, on average, effects 0.20 effect size units larger than programs delivered in classroom settings. Programs that emphasized content relating to social problem solving or the problem solving sequence also showed greater improvements in self-regulation.**

Exhibit 6. Core Components of Universal and Selected Skill-building Interventions (k=93; n=247)

Core Components	b	se	
Intercept	0.14	0.03	
Delivered in a pull-out school or community setting (vs. in class)	0.20	0.07	**
Content Element: Problem solving sequence	0.12	0.06	†
Model Statistics			
Q-model	10.03	**	
Q-residual	477.07	***	
τ^2 (between)	0.01		
τ^2 (within)	0.05		
I^2	52.09%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† p<.10, * p<.05, ** p<.01, *** p<.001

The fit statistic (Q-model) indicates that the configuration of core components identified from the research account for significant between-study differences. Comparing the τ^2 and I^2 values from the models in Exhibit 6 to the null model for skill-building interventions shown in Exhibit 1, we see that our core components reduce the variability in the distribution. Although rather substantial variability remains, as suggested by the still relatively large I^2 value, the fact that features of the programs that we can identify in the research might be influential enough to effect practice is encouraging. Practice guidelines developed from these findings, thus, have potential to result in positive changes in youth outcomes.

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[1] The intercept in a meta-regression model represents the estimated (or average) effect size when the categorical covariates in the model are all equal zero. The intercept for the model shown in Exhibit 6, therefore, is the estimated average effect size for programs delivered in classrooms that did not emphasize the problem solving sequence. In models with continuous covariates (e.g., Exhibit 10), the intercept represents the estimated average effect size at the mean of the continuous covariate and when the categorical covariates equal zero.

5.2 Core Components for Targeted Family Relations and Parenting Skills Interventions

We turn now to the targeted interventions in our dataset. The key features of the targeted family relations and parenting skills interventions are shown in Exhibit 7 along with the correlations between selected features and effect sizes. About half of the programs in this intervention family were less than 13 weeks in duration, though others were considerably longer. Most programs were community-based (rather than school-based). Researchers and mental health professionals were the most common delivery personnel.

Exhibit 7.   Characteristics of Targeted Family Relations and Parenting Skills Interventions (k=27)

	Frequency (%) Mean (sd)	Correlation with Effect Size		Frequency (%) Mean (sd)	Correlation with Effect Size
Implementation Quality			**Primary Setting**		
Explicit or suggested problems	11 (41%)	-0.23	Resource room	4 (15%)	-0.02
No problems or no mention of problems	16 (59%)	0.23	Outpatient	18 (67%)	-0.02
Implementation monitoring=Yes	24 (89%)	-0.09	All others	5 (19%)	0.03
Delivery Complexity			**Program Documentation**		
Number of different formats=3 or more (vs. 1-2)	12 (44%)	-0.21	Lesson plan-based program	19 (70%)	0.03
Number of different provider types	2.2 (1.0)	0.10	No lesson plans, content-oriented	3 (11%)	-0.03
Number of different settings	1.6 (0.9)	0.11	Focus on structural changes	4 (15%)	-0.03
Delivery complexity			Combination	1 (4%)	0.00
Provider Training and Supervision			**Program Modifications**		
Provider training=Yes	24 (89%)	0.14	Modified original program	6 (22%)	-0.26
Provider supervision=Yes	19 (70%)	0.08	No, delivered as designed	18 (67%)	0.21
Dosage			Not a lesson plan-based program	3 (11%)	0.08
Duration (weeks)			**Transportability**		
<13 weeks	14 (52%)	-0.06	Program is transportable	25 (93%)	0.00
13-51 weeks	9 (33%)	0.08	**Participant Characteristics**		
52+ weeks	4 (15%)	-0.03	Presenting problem=Externalizing	23 (85%)	0.24
Frequency=daily (vs. < daily)	8 (30%)	0.02	Average age	9.0 (3.3)	0.02
Primary Location			*Grade Level*		
School	6 (22%)	-0.05	Elementary school	12 (44%)	-0.11
Community	21 (78%)	0.05	Middle school	2 (7%)	-0.05
Alternative school	0 (0%)		High school	1 (4%)	-0.01
Primary Format			Mixed grade levels	12 (44%)	0.15
One-on-one	10 (37%)	0.28	*Gender Mix*		
Group (not classroom)	9 (33%)	-0.21	50-60% male	3 (11%)	-0.14
All others	8 (30%)	-0.08	>60% male	20 (74%)	0.13
Delivery Personnel			>95% male	4 (15%)	0.01
Researcher	10 (37%)	0.00	*Predominant Race/Ethnicity*		
Psychologist, psychiatrist	7 (26%)	-0.21	White	15 (56%)	
All others	10 (37%)	0.20	Black	4 (15%)	
Intervention Family Subcategory			Mixed, none more than 60%	8 (30%)	
Family relations	16 (59%)	-0.13			
Parent training	11 (41%)	0.13			

Note. k=number of studies. The correlations shown in the table are bivariate inverse variance weighted correlations between the potential effectiveness factor and the effect size. For binary variables (e.g., implementation quality) the correlation is reported for only one direction. For categorical variables, the correlations reported are for the category shown with all other values on the variable in the reference category. The correlations are reported only for variables or categories within categorical variables with at least 10 cases in the category.

We present the meta-regression model for the targeted family process and parenting skills programs in Exhibit 8. Three core components were independently associated with effective targeted family process and parenting skills interventions based on the thresholds for meaningful relationships we discussed earlier. Two are statistically significant and all three have relationships with the effect sizes suggesting that a change on a component is associated with a meaningful difference on self-regulation outcomes. **Family relations and parenting skills programs in which services were delivered in one-on-one formats tended to show more positive outcomes than those with group formats.** One content element was associated with program impacts: **programs that incorporated behavior modification strategies were associated with larger average impacts.** Finally**, implementation problems were associated with smaller impacts.**

Exhibit 8.   Core Components of Targeted Family Process and Parenting Skills Interventions (k=27; n=89)

Core Components	b	se	
Intercept	0.39	0.10	
Delivery format: one-on-one	0.32	0.12	**
Content element: Behavior modification strategies (either positive or negative or both)	0.13	0.11	
Implementation: Explicit or suggested problems	-0.25	0.11	*
Model Statistics			
Q-model	15.55	**	
Q-residual	369.42	***	
τ^2 (between)	0.02		
τ^2 (within)	0.11		
I^2	74.44%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† p<.10, * p<.05, ** p<.01, *** p<.001

The fit statistic (Q-model) indicates that the configuration of core components identified from the research account for significant between-study differences. Comparing the τ^2 and I^2 values from the models in Exhibit 8 to the null model for targeted family process and parenting skills programs shown in Exhibit 1, we see that our core components reduce the variability in the distribution. The very small τ^2-between value shown in Exhibit 8 suggests that we would be unlikely to identify other components that might be associated with self-regulation outcomes, although the larger τ^2-within value indicates that there is variability within studies that might be explained by different measures of self-regulation reporting within studies. We will explore this possibility in Appendix C. Nonetheless, the good fit of the model and meaningful coefficients suggest that practice guidelines developed from these findings will have good potential to result in positive changes in youth outcomes.

5.3 Core Components of Targeted Relational Interventions

The key features of the targeted relational programs are shown in Exhibit 9. Programs in this intervention family average 18 weeks in duration and tend to be delivered once a week. School and community locations are represented. A majority of the programs delivered services primarily in a one-on-one format. The youth participants were somewhat older than those in the previous intervention families (12 years for relational programs vs. the average of 10.6 years across all programs). Lesson plans or highly scripted formats are less common in this intervention family, as might be expected with programs focused on promoting positive relationships. Program modifications or programs that did not have lesson plans to modify were common. Mental health professionals were the most common delivery personnel. Both sub-types of relational programs – those that are more open-ended and those that follow a particular therapeutic orientation – were well-represented.

Exhibit 9.   Characteristics of Targeted Relational Interventions (k=28)

	Frequency (%) Mean (sd)	Correlation with Effect Size		Frequency (%) Mean (sd)	Correlation with Effect Size
Implementation Quality			**Primary Setting**		
Explicit or suggested problems	14 (50%)	-0.31	Regular classroom	4 (14%)	0.31
No problems or no mention of problems	14 (50%)	0.31	Resource room	16 (57%)	0.13
Implementation monitoring=Yes	22 (79%)	-0.01	Outpatient	3 (11%)	0.06
Delivery Complexity			All others	5 (18%)	-0.31
Number of different formats	1.5 (0.7)	-0.07	**Program Documentation**		
Number of different provider types	1.4 (0.6)	-0.46	Lesson plan-based program	6 (21%)	0.15
Number of different settings	1.4 (0.8)	0.10	No lesson plans, content-oriented	5 (18%)	0.13
Provider Training and Supervision			Focus on structural changes	15 (54%)	0.15
Provider training=Yes	21 (75%)	0.01	Combination	2 (7%)	-0.32
Provider supervision=Yes	13 (46%)	-0.25	**Program Modifications**		
Dosage			Modified original program	5 (18%)	0.04
Duration (weeks)	18.3 (11.1)	-0.23	No, delivered as designed	10 (36%)	-0.14
Frequency (sessions/week)		0.38	Not a lesson plan-based program	13 (46%)	0.13
Less than weekly	4 (14%)		**Transportability**		
1x/week	12 (43%)		Program is transportable	16 (57%)	-0.24
1-2x/week	7 (25%)		**Participant Characteristics**		
3-4x/week	3 (11%)		Presenting problem=Externalizing	17 (61%)	-0.38
Daily (5x/week)	2 (7%)		Average age	12.0 (4.0)	0.15
Primary Location			*Grade Level*		
School	19 (68%)	-0.30	Elementary school	14 (50%)	0.22
Community	6 (21%)	0.13	Middle school	1 (4%)	-0.37
Alternative school	3 (11%)	0.34	High school	10 (36%)	0.35
Primary Format			Mixed grade levels	3 (11%)	-0.14
One-on-one	16 (57%)	-0.04	*Gender Mix*		
Group (not classroom)	6 (21%)	0.38	<60% male	5 (18%)	0.20
All others	6 (21%)	-0.33	>60% male	12 (43%)	-0.48
Delivery Personnel			>95% male	11 (39%)	0.41
Researcher, study author	7 (25%)	0.08	*Predominant Race/Ethnicity*		
Laypersons, paraprofessionals	6 (21%)	0.05	White	13 (46%)	
Psychiatrist, psychologist	11 (39%)	0.32	Black	8 (29%)	
All others	4 (14%)	-0.39	Mixed, none more than 60%	7 (25%)	

	Frequency (%) Mean (sd)	Correlation with Effect Size		Frequency (%) Mean (sd)	Correlation with Effect Size
Intervention Family Subcategory					
Counseling: Open-ended	12 (43%)	0.09			
Counseling: Specific orientation	16 (57%)	-0.09			

Note. k=number of studies. The correlations shown in the table are bivariate inverse variance weighted correlations between the potential effectiveness factor and the effect size. For binary variables (e.g., implementation quality) the correlation is reported for only one direction. For categorical variables, the correlations reported are for the category shown with all other values on the variable in the reference category. The correlations are reported only for variables or categories within categorical variables with at least 10 cases in the category.

Exhibit 10 shows the meta-regression model for this intervention family. The analysis identified three core components for the targeted relational interventions. **Programs delivered by mental health professionals and those offered more frequently during the week were associated with better outcomes than programs delivered by other types of personnel or those that were less frequent.** In addition, **programs with explicit implementation problems tended to show less positive effects on self-regulation.**

Exhibit 10.   Core Components of Targeted Relational Interventions (k=28; n=50)

Core Components	b	se	
Intercept	0.35	0.09	
Frequency of sessions per week	0.15	0.07	*
Delivery personnel = Mental health professionals	0.14	0.14	
Implementation: Explicit or suggested problems	-0.16	0.16	
Model Statistics			
Q-model	7.14	†	
Q-residual	71.00	*	
τ^2 (between)	.06		
τ^2 (within)	0.001		
I^2	52.26%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† $p<.10$, * $p<.05$, ** $p<.01$, *** $p<.001$

The Q for the model is marginally statistically significant but the residual Q is also significant indicating that the variables in the model account for some but not all of observed variability in program effects across studies. There may be additional variables not included in our dataset that explain some of the remaining variability in the program impacts. Thus, although practice recommendations developed from this model may have potential to improve outcomes, there may be other practices that might also improve program outcomes.

5.4 Core Components of Targeted Skill-building Interventions

The key features of the 77 studies of targeted skill-building interventions are shown in Exhibit 11. Like the relational programs, skill-building programs are delivered across classroom, pull-out, and community settings, but the skill-building programs tend to be shorter than the relational and academic and educational programs. The one-on-one format is also somewhat less common in this category. We see teachers as delivery personnel in a number of cases, but researchers and program or site staff are also observed as delivery personnel.

Exhibit 11.   Characteristics of Targeted Skill-building Interventions (k=77)

	Frequency (%) Mean (sd)	Correlation with Effect Size		Frequency (%) Mean (sd)	Correlation with Effect Size
Implementation Quality			**Primary Setting**		
Explicit or suggested problems	24 (31%)	-0.19	Regular classroom	16 (21%)	0.02
No problems or no mention of problems	53 (69%)	0.19	Resource room	44 (57%)	0.04
Delivery Complexity			Afterschool	5 (7%)	-0.23
Number of different formats	1.6 (1.0)	0.01	Outpatient	5 (7%)	0.13
Number of different provider types	1.6 (0.8)	-0.05	All others	7 (9%)	-0.03
Number of different settings	1.4 (0.9)	-0.09	**Program Documentation**		
Provider Training and Supervision			Lesson plan-based program	50 (65%)	0.09
Provider training=Yes	51 (66%)	-0.02	No lesson plans, content-oriented	21 (27%)	-0.08
Provider supervision=Yes	40 (52%)	0.10	Focus on structural changes	4 (5%)	0.00
Dosage			Combination	2 (3%)	-0.06
Duration (weeks)	14.4 (2.6)	-0.08	**Program Modifications**		
Number of sessions	20.3 (15.2)	-0.20	Modified original program	23 (30%)	0.20
Frequency (sessions/week)		-0.13	No, delivered as designed	48 (62%)	-0.21
Less than weekly	4 (5%)		Not a lesson plan-based program	6 (8%)	0.06
1x/week	24 (31%)		**Transportability**		
1-2x/week	6 (8%)		Program is transportable	69 (90%)	-0.08
2x/week	23 (30%)		**Participant Characteristics**		
More than 2x/week	20 (26%)		Presenting problem=Externalizing	65 (84%)	0.01
Primary Location			Average age	10.7 (2.6)	0.07
School	58 (75%)	-0.15	*Grade Level*		
Community	12 (16%)	0.13	Elementary school	43 (56%)	-0.10
Alternative school	7 (9%)	0.08	Middle school	18 (23%)	0.18
Primary Format			High school	3 (4%)	-0.04
One-on-one	20 (26%)	0.04	Mixed grade levels	13 (17%)	-0.01
Group (not classroom)	42 (55%)	0.04	*Gender Mix*		-0.07
Student group (classroom)	15 (20%)	-0.11	<50% male	4 (5%)	
Delivery Personnel			50-60% male	14 (18%)	
Researcher	26 (34%)	-0.01	>60% male	44 (57%)	
Teachers	15 (20%)	-0.13	>95% male	15 (20%)	
Program/site staff, specialists	15 (20%)	0.20	*Predominant Race/Ethnicity*		
Self-directed	10 (13%)	-0.09	White	24 (31%)	
All others	11 (14%)	-0.01	Black	28 (36%)	
Intervention Family Subcategory			Latinx	10 (13%)	
Interpersonal + affective/executive	23 (30%)	-0.02	Mixed, none more than 60%	15 (20%)	

	Frequency (%) Mean (sd)	Correlation with Effect Size		Frequency (%) Mean (sd)	Correlation with Effect Size
Interpersonal	13 (17%)	0.04			
Affective/executive	36 (47%)	0.00			
Mindfulness	5 (7%)	0.02			

Note. k=number of studies. The correlations shown in the table are bivariate inverse variance weighted correlations between the potential effectiveness factor and the effect size. For binary variables (e.g., implementation quality) the correlation is reported for only one direction. For categorical variables, the correlations reported are for the category shown with all other values on the variable in the reference category. The correlations are reported only for variables or categories within categorical variables with at least 10 cases in the category.

The meta-regression model for the targeted skill-building programs is shown in Exhibit 12. Five core components are shown in the model. **Programs for which no implementation problems were mentioned showed larger impacts than those for which problems were identified by study authors. Provider supervision, another indicator of implementation quality, was also associated with improvements in self-regulation outcomes. In addition, programs that were modified from the original manual or those that offered less scripted delivery options showed more positive impacts.** Skill-building **programs that included relaxation skills training content showed better improvement in self-regulation** than programs without such content. In addition, **programs that employed instructional strategies that included modeling and role play, rehearsal, and practice resulted in greater improvements in self-regulation**.

Exhibit 12. Core Components of Targeted Skill-building Interventions (k=77; n=382)

Core Components	b	se	
Intercept	-0.09	0.11	
Implementation: No problems or no problems mentioned	0.23	0.08	**
Provider supervision=Yes	0.11	0.07	
Program modified or not scripted (vs. delivered according to script)	0.12	0.08	
Content element: Relaxation skills training	0.17	0.09	†
Process element: Modeling *and* role play, rehearsal, practice	0.11	0.08	
Model Statistics			
Q-model	15.67	**	
Q-residual	626.75	***	
τ^2 (between)	0.06		
τ^2 (within)	0.02		
I^2	48.95%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† p<.10, * p<.05, ** p<.01, *** p<.001

The fit statistic for the model indicates that the configuration of core components identified from the research account for significant between-study differences. Comparing the τ^2 and I^2 values from the model in Exhibit 12 to the null model for skill-building programs shown in Exhibit 1, we see that our core components do reduce the variability in the distribution, although variability remains that could be explained by other unknown characteristics of the studies or by the methodological features of the studies that we examine in Appendix C. The model fit and meaningful coefficients for several of the variables suggest that practice guidelines developed from these findings do have potential to result in positive changes in youth outcomes.

5.5 Core Components for Targeted Behavior Management Interventions

The key characteristics of the 24 studies of targeted behavior management interventions are shown in Exhibit 13. All were school-based. Behavior management programs averaged about 16 weeks in duration, many taking place every school day. The majority of behavior management programs were delivered in classroom settings and about half were administered one-on-one. Graduate and undergraduate students working for researchers were common delivery personnel.

Exhibit 13.   Characteristics of Targeted Behavior Management Interventions (k=24)

	Frequency (%) Mean (sd)	Correlation with Effect Size		Frequency (%) Mean (sd)	Correlation with Effect Size
Implementation Quality			**Primary Setting**		
Explicit or suggested problems	9 (38%)	-0.38	Regular classroom	17 (71%)	-0.02
No problems or no mention of problems	15 (63%)	0.38	Resource room	7 (29%)	0.02
Implementation monitoring=Yes	20 (83%)	-0.21	**Program Documentation**		
Delivery Complexity			Lesson plan-based program	2 (8%)	0.04
Number of different formats	1.5 (0.8)	-0.45	No lesson plans, content-oriented	8 (33%)	0.29
Number of different provider types	2.0 (0.9)	-0.08	Focus on structure	8 (33%)	0.34
Number of different settings	1.5 (0.7)	-0.28	Combination	6 (25%)	-0.48
Provider Training and Supervision			**Program Modifications**		
Provider training=Yes	22 (92%)	-0.09	Modified original program	4 (17%)	0.03
Provider supervision=Yes	19 (79%)	-0.25	No, delivered as designed	11 (46%)	-0.19
Dosage			Not a lesson plan-based program	9 (38%)	0.22
Duration (weeks)	16.3 (15.3)	-0.52	**Transportability**		
Frequency (sessions/week)			Program is transportable	17 (71%)	0.42
Up to 3x/week	3 (13%)	0.20	**Participant Characteristics**		
3-4x/week	3 (13%)	0.15	Presenting problem=Externalizing	17 (71%)	-0.12
5x/week, daily	18 (75%)	-0.26	Average age	8.7 (1.7)	0.43
Primary Location			*Grade Level*		
School	24 (100%)		Elementary school	17 (71%)	-0.23
Primary Format			Middle school	3 (13%)	0.15
One-on-one	16 (67%)	0.56	High school	0 (0%)	
Group (not classroom)	4 (17%)	0.01	Mixed grade levels	4 (17%)	0.18
Student group (classroom)	4 (17%)	-0.54	*Gender Mix*		
Delivery Personnel			Mostly or all male	21 (88%)	-0.03
Graduate, undergraduate students	16 (67%)	0.03	*Predominant Race/Ethnicity*		
Teachers	4 (17%)	-0.08	White	6 (25%)	
All others	4 (17%)	0.08	Black	11 (46%)	
			Mixed, none more than 60%	7 (29%)	

Note. k=number of studies. The correlations shown in the table are bivariate inverse variance weighted correlations between the potential effectiveness factor and the effect size. For binary variables (e.g., implementation quality) the correlation is reported for only one direction. For categorical variables, the correlations reported are for the category shown with all other values on the variable in the reference category. The correlations are reported only for variables or categories within categorical variables with at least 10 cases in the category.

The core components meta-regression analysis for behavior management interventions shown in Exhibit 14 identifies two components that are associated with program impacts. **Programs delivered in a one-on-one format tended to have larger impacts**. In addition, **programs with content explicitly focused on appropriate classroom behavior exhibited larger impacts** than those without such content.

Exhibit 14.   Core Components of Targeted Behavior Management Interventions (k=24; n=59)

Core Components	b	se	
Intercept	0.03	0.11	
One-on-one format	0.22	0.11	†
Content Element: Focus on appropriate classroom behavior	0.25	0.13	†
Model Statistics			
Q-model	12.69	***	
Q-residual	60.68		
τ^2 (between)	0.01		
τ^2 (within)	0.00		
I^2	16.37%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† $p<.10$, * $p<.05$, ** $p<.01$, *** $p<.001$

The Q for the model is statistically significant and the residual Q is not indicating that the variables in the model account for the observed variability in program effects across studies. The very small τ^2 and I^2 values further indicate that little variability remains that can be explained by other variables, including method variables. Thus, the configuration of core components for the targeted behavior management programs has potential to guide practice towards better outcomes.

5.6 Core Components for Targeted Academic and Educational Interventions

The characteristics of the final intervention family, the targeted academic and educational programs, are shown in Exhibit 15. The programs in this family are generally longer than the programs in other families. All are school-based, although afterschool programs are represented. Delivery personnel include researchers, teachers, and program staff (such as staff who administer afterschool programs).

Exhibit 15.   Characteristics of Targeted Academic, Educational Interventions (k=19)

	Frequency (%) Mean (sd)	Correlation with Effect Size		Frequency (%) Mean (sd)	Correlation with Effect Size
Implementation Quality			**Primary Setting**		
Explicit or suggested problems	5 (26%)	-0.22	Regular classroom	7 (37%)	-0.24
No problems or no mention of problems	14 (74%)	0.22	Resource room	7 (37%)	0.30
Implementation monitoring=Yes	17 (90%)	0.03	Afterschool	5 (26%)	-0.10
Delivery Complexity			**Program Documentation**		
Number of different formats	1.8 (1.1)	-0.11	Lesson plan-based program	10 (53%)	0.12
Number of different provider types	1.8 (0.8)	-0.09	No lesson plans, content-oriented	3 (16%)	0.03
Number of different settings	1.3 (0.6)	-0.13	Focus on structural changes	3 (16%)	0.16
Provider Training and Supervision			Combination	3 (16%)	-0.28
Provider training=Yes	15 (78%)	-0.09	**Program Modifications**		
Provider supervision=Yes	10 (53%)	-0.24	Modified original program	4 (21%)	0.08
Dosage			No, delivered as designed	14 (74%)	0.04
Duration (weeks)	23.2 (22.8)	-0.30	Not a lesson plan-based program	1 (5%)	-0.16
Frequency (sessions/week)			**Transportability**		
1x/week or less	5 (26%)	-0.20	Program is transportable	17 (90%)	-0.06
1-2x/week	3 (16%)	0.26	**Participant Characteristics**		
2x/week	6 (32%)	-0.07	Presenting problem=Externalizing	10 (53%)	0.10
2-3x/week	2 (11%)	-0.11	Average age	11.4 (2.5)	-0.02
3x/week or more	3 (16%)	-0.03	*Grade Level*		
Primary Location			Elementary school	7 (37%)	0.08
School	19 (100%)		Middle school	9 (47%)	0.00
Primary Format			High school	2 (11%)	-0.14
One-on-one	7 (37%)	0.26	Mixed grade levels	1 (5%)	0.00
Group (not classroom)	3 (16%)	-0.10	*Gender Mix*		
Student group (classroom)	7 (37%)	-0.16	All or mostly female	2 (11%)	0.19
All other formats	2 (11%)	-0.09	50-60% male	6 (32%)	-0.29
Delivery Personnel			All or mostly male	11 (58%)	0.15
Researcher or graduate students	5 (26%)	-0.07	*Predominant Race/Ethnicity*		
Teachers, school staff	4 (21%)	-0.21	White	6 (32%)	
Program staff, specialists, social workers	7 (37%)	0.19	Black	5 (26%)	
All others	3 (16%)		Latinx	2 (11%)	
			Mixed, none more than 60%	6 (32%)	

Note. k=number of studies. The correlations shown in the table are bivariate inverse variance weighted correlations between the potential effectiveness factor and the effect size. For binary variables (e.g., implementation quality) the correlation is reported for only one direction. For categorical variables, the correlations reported are for the category shown with all other values on the variable in the reference category. The correlations are reported only for variables or categories within categorical variables with at least 10 cases in the category.

Exhibit 16 presents the results of the core components meta-regression analysis for the targeted academic and educational interventions. For the studies in this intervention family, one method variable was highly confounded with some of our potential core components. To improve the fit of the model and isolate the effects of the potential core components, a variable for the type of self-regulation outcome measured was included in the model. Of the remaining variables, several core components were identified. **Programs delivered in a group pull-out format in school settings such as resource rooms or counselor's offices showed larger improvements in self-regulation than programs delivered in classroom settings. Programs with behavior management and reinforcement content showed better outcomes than programs without this content.** In addition, **programs that experience implementation problems tended to have smaller impacts**.

Exhibit 16.   Core Components of Targeted Academic and Educational Interventions (k=19; n=65)

Core Components	b	se	
Intercept	0.17	0.14	
Type of self-regulation: Planful behavior	-0.28	0.11	*
Primary setting: School resource room; pull-out program	0.28	0.12	
Content element: Behavior management and reinforcement	0.27	0.13	*
Implementation: Explicit or suggested problems	-0.12	0.13	
Model Statistics			
Q-model	14.60	**	
Q-residual	147.41	***	
τ^2 (between)	0.01		
τ^2 (within)	0.07		
I^2	60.50%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† p<.10, * p<.05, ** p<.01, *** p<.001

The overall model fit for the targeted academic-educational interventions is moderate. The Q-model statistic is statistically significant and the τ^2 between indicates that substantial between-studies variability has been accounted for by the components in the model. However, a relatively large I^2 remains. In addition, the τ^2 within value suggests that there is variability within studies that we have not yet accounted for in spite of including the measurement variable in the model. This will be explored further in Appendix C. Although we know that the methods variables have some influence in this intervention family, the model statistics shown here and the relatively meaningful coefficients suggest that practice guidelines developed from this model have potential to improve youth self-regulation outcomes.

6 Conclusions

Overall, our analysis identified a range of actionable core components from the research on youth programs targeting self-regulation outcomes. The different intervention families in the analysis, a number of core components were identified, as summarized in Exhibit 17 below. The core components we identified for the intervention families explain meaningful differences in program impacts and, thus, have good potential to inform practice guidelines. For each intervention family, we have identified actionable core components from models with reasonable fits to the data. These core components have been translated into practice recommendations in the associated practice guidelines (link to self-regulation guide).

Exhibit 17.   Summary of Core Components for Each Intervention Family

	Program Content and Process	Program Structure	Implementation Quality
Skill-Building Programs	Programs that included social problem-solving skills training showed larger impacts.	Programs delivered in pull-out formats in school settings or in small groups in community settings exhibited larger impacts.	
Family Relations and Parenting Skills		One-on-one formatted programs exhibited larger program impacts. More frequent programs exhibited larger impacts.	Explicit mention of implementation problems was associated with smaller program impacts.
Relational Programs		More frequent programs exhibited larger impacts. Programs delivered by mental health professionals showed larger impacts.	Explicit mention of implementation problems was associated with smaller program impacts.
Skill-Building Programs	Programs with a focus on relaxation skills showed larger impacts. Programs that used modeling, role play, practice, and rehearsal showed larger impacts	Programs that were adapted to fit the context or that had flexible manuals that allowed them to be adaptable showed larger impacts	Provider supervision was associated with larger impacts. Programs with no mentioned implementation problems showed larger impacts.
Behavior Management Programs	Programs with an explicit focus on appropriate classroom behavior showed larger impacts.	One-on-one formatted programs exhibited larger program impacts.	
Academic-Educational Programs	Programs with behavioral content and behavioral strategies showed larger impacts.	Programs delivered in pull-out formats in school settings showed larger program impacts.	Explicit mention of implementation problems was associated with smaller program impacts.

Reflecting on the evidence base and our methodological approach, we identify several issues for consideration. First, it is inherent in this work to code and categorize the bits and pieces of studies, programs, and outcomes into a form that we

can analyze quantitatively. To identify core components, we needed to find ways to label and categorize interventions and their components. Our scheme begins with organizing programs into intervention families. We are aware of other efforts to categorize and organize different types of interventions (e.g., Michie, van Stralen, & West, 2011; Murray et al., 2019), but none of the options we explored were a good fit for our case. The Murray et al. (2019) scheme is focused on interventions with specific self-regulation content. Our method involves collecting evaluations of any kind of program that report on our outcome of interest (in this case, self-regulation) so we needed a scheme that was somewhat broader than the one proposed by Murray and her colleagues. The Michie et al. behavior change wheel is compelling and more able to capture the broad set of interventions in our database, but it is more focused on designing effective interventions than tinkering with those that already exist. We think our simpler scheme, which is organized around intervention families that are familiar to practitioners, made the most sense for our purposes.

In addition, our definition of core components includes more than just program content. Thus, we also needed to develop a scheme for coding the components of the programs – the content and process elements shown in Exhibits 3 and 4 and defined in Appendix A. The coding scheme for the program structure, implementation strategies and challenges, and participant characteristics variables was based on a framework for exploring variability in treatment effects developed by Weiss and colleagues (Weiss et al., 2013) that has four categories of components – program content, program quantity, program quality, and program conveyance. The scheme captures the most salient aspects of program quantity, quality, and conveyance, but is limited in application by the inconsistent and often rather limited reporting of program details in the research literature.

One particularly tricky aspect of the research we explored for this report stems from the self-regulation outcomes themselves. Although there are well-developed definitions for self-regulation that differentiate the cognitive, behavioral, and emotional aspects of the construct, it is rarely measured so neatly. The measures in the evaluation research are rarely described in much detail and, when they are, they may combine one or more of these aspects in single scales or subscales. Terminology is inconsistent and not standardized, so even if there is detail about a measure, it can be difficult to determine which scales and subscales align with the conceptual definition of self-regulation laid out by Murray et al. (2015). Although we are able to explore the components of programs that are associated with improvements in self-regulation defined very broadly, the measures of self-regulation are not consistent enough to support exploration of the specific components of programs that might improve particular aspects of self-regulation. We do know that different aspects of self-regulation can be associated with different impacts (see Appendix C below), but the construct sub-domains we are able to extract from the literature are rather makeshift and do not align well with conceptual definitions of the construct (cf. Murray et al., 2015).

Finally, the findings in this report and the meta-regression analyses we use to produce them are correlational and it would be incorrect to draw causal conclusions from this work. We also note that there is a limited range of and, especially, detail about potential core components available from the contributing studies. We extracted from the studies and explored in our analyses a number of variables, but large proportions of the differences in effectiveness we see between studies is left unexplained. Future studies and, we hope, better reporting of key program and implementation features may further improve our ability to identify more features associated with positive effects.

Indeed, the ultimate test of the validity of results such as these is not the statistical relationships we observe among the source studies, but demonstrations in the field that programs with the identified core components do in fact have better outcomes.

Appendix A. The Meta-Analytic Database

This report makes use of studies from two sources: (1) a large meta-analytic database developed by Sandra Wilson of Abt Associates and her former colleague, Mark Lipsey of Vanderbilt University, that houses the results of hundreds of studies of youth programs, and (2) additional studies identified by Abt Associates through a comprehensive literature search for studies of youth programs published since 2004 and conducted in December, 2019. The original database is a compilation of seven separate meta-analyses of youth programs conducted by two teams (Lipsey/Wilson and Joseph Durlak). This appendix provides details about the original meta-analytic database as well as the database update.

Original Meta-analytic Database

The research captured in the original database represents a range of program environments and age ranges and includes only randomized controlled trials or quasi-experiments of relatively high quality. Each study provides estimates of program impacts (i.e., effect sizes) for the major study outcomes, along with descriptive details about each study's program, providers, participants, and implementation activities. Many of the studies in the database provide information about the programs, providers, and implementation activities that serve as our potential effectiveness factors. Some studies provide extensive detail, while for others reporting is somewhat limited. To maximize the utility of our approach, it would be desirable to have more information reported about the features that serve as our potential effectiveness factors than we typically find in the research. But, within the limits of what is reported, the common coding scheme we developed to collate the seven meta-analyses attempts to capture as much detail as possible about the wide range of topics that might inform our work. Exhibit A1 describes the range of programs and outcomes included in the database and the year of publication for the most recent studies in each. For the analyses reported in this report, we selected studies from any of the seven meta-analyses involving selected or indicated prevention programs that reported program impacts on self-regulation.

Exhibit A1.   The Seven Meta-Analyses Included in the Original Database

Meta-analysis	Studies Included	Primary Outcomes	Most Recent Studies
After-school programs (Durlak, Weissberg, & Pachan, 2010)	68 studies of after-school programs for youth age 5-18	Social-emotional skills, self-esteem, conduct problems/externalizing, academic performance, school attendance and engagement, and substance use	2007
School-based social and emotional learning programs (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011)	213 studies of universal school-based programs for youth age 5-18 targeting social-emotional learning	Social-emotional skills, positive social behavior, conduct problems/externalizing, internalizing problems, academic performance, self-esteem, and school attitudes	2007
School-based prevention programs for acting out problems (Payton, et al., 2008)	38 studies of school-based prevention programs for acting out problems for at-risk children in grades K-6	Positive social behavior and conduct problems/externalizing	2007
Parent and family programs for improving child mental health outcomes (Durlak, 2007)	57 studies of programs intervening with parents or family to influence outcomes for school-aged children (age 5-18)	Positive social behavior, family relations, conduct problems/externalizing, and emotional distress/internalizing problems	2007
Interventions for juvenile offenders (Lipsey, 1992; Lipsey, 2009)	583 studies of interventions for juvenile offenders age 12-21	All the studies have delinquency outcomes; other outcomes include social-emotional skills, self-esteem, peer and family relations, emotional distress/internalizing problems, school attendance, school dropout, school performance, and conduct problems	2007

Meta-analysis	Studies Included	Primary Outcomes	Most Recent Studies
Early interventions targeting risk for antisocial behavior (Wilson, Lipsey, & Derzon, 2003; Wilson & Lipsey, 2007)	456 studies of interventions for youth under age 18 focused on antisocial behavior and risk for antisocial behavior	All the studies have conduct problem outcomes; other outcomes include social-emotional skills, peer relations, self-esteem, self-control, internalizing, and academic performance	2004
School dropout prevention programs (Wilson, Tanner-Smith, Lipsey, Steinka-Fry, & Morrison, 2011)	317 studies of school dropout prevention programs	All have school dropout or graduation outcomes; other outcomes include attendance, academic performance, school attachment, and conduct problems/externalizing	2009

Update to the Database

Abt Associates conducted an extensive literature search in late 2019 for studies of youth programs that report a self-regulation outcome, resulting in over 25,000 records published since 2004. Abt staff obtained and screened those studies for eligibility, adding 203 new studies to the original database. The most recent studies in the update were published in 2019. Each study was coded into the database by trained coders using the common coding scheme described below.

Coded Variables in the Meta-analytic Database

This section shows the coding items as they are coded in the database for all of the variables used in the analyses reported in this report in the program structure, implementation strategies and challenges, and participant characteristics domains. We also show the coding items for the methodological characteristics. The detailed scheme we used to code program content and process elements is included in the next section. In most cases, variables were combined or recoded for analysis.

Program Structure

Duration of treatment. Approximate (or exact) number of weeks that subjects received treatment, from first treatment event to last excluding follow-ups designated as such. Divide days by 7; multiply months by 4.3. Code 999 if cannot tell. Estimate for this item if necessary, and if you can come up with a reasonable order of magnitude number.

Approximate (or exact) frequency of contact between participants and provider or program activity. This refers *only* to the elements of treatment that are different from what the comparison group receives.

1. Less than weekly
2. Once a week
3. 1-2 times a week
4. 2 times a week
5. 2-3 times a week
6. 3 times a week
7. 3-4 times a week
8. 4 times a week
9. Daily contact (not 24 hours of contact per day but some treatment during each day, perhaps excluding weekends, e.g., as in a school-based program that occurs every school day)
99. Cannot tell

Primary location of the program. Where does the service delivery take place?

1. School
2. Not school
4. Alternative school (must be clearly specified as "alternative" school)

Specific Site Detail. Where was the intervention delivered? Think about the actual treatment events and where they occurred. Check all that apply.

School Sites
1.   Regular Classroom (interventions delivered during regularly scheduled classes AND in the children's regular classroom, includes regular "specials" classes or electives like P.E. or music)
2.   Special Class (e.g., children in treatment are in a classroom-type setting that is different from a typical classroom, although it may be the subjects' usual classroom – includes such settings as special education classrooms, alternative schools, etc.)
3.   Entire School; Systemic (this would include interventions like metal detectors and other environmental changes that presumably affect the whole school)
4.   Resource Room, School Counselor's Office, or other similar setting that is NOT the children's regular classroom; the idea here is that children are removed from class for treatment
5.   School Playground
6.   School Site, cannot tell which of the above
7.   After School: treatment delivered at school facility, but not during regular school hours

Non-school Sites
8.   Outpatient, Non-residential, office, clinic, center (e.g., YMCA, university, therapist's office, medical facility, probation department, community, or neighborhood center)
10. Home (intervention delivered in the subject's home)
11. Religious institution (not parochial schools, which would be coded above)
12. Park, playground, wilderness area, etc.
13. Work site (e.g., community service, trash collection on roadside, etc.)
14. Universal (e.g., media intervention)

17. Other

Focal Intervention Site. From the list above, select the focal intervention site. When there is more than one intervention site, the focal site is the site where the bulk of the intervention was delivered (i.e., where the participants spent the most time receiving direct services). If you cannot tell which of multiple sites is focal, flag the study for discussion so that decision rules can be made moving forward.

Who delivered the intervention? The items in this section refer to the delivery personnel, i.e., the individuals who have direct contact with the children served by the program (or parents for parent training interventions). From the following list, check all that apply and, in the last item in the sequence, identify the primary or "focal" service provider.

1.   Researcher/author only
2.   Graduate or undergraduate students
3.   Regular teachers
4.   School staff
5.   Laypersons, volunteers, paraprofessionals
6.   Psychiatrist, psychologist
7.   Social worker, caseworker, school counselor, vocational counselor (typically master's level)
8.   Law enforcement, authority figures
9.   Program/site staff, specialists
10. Parents
11. Peers
12. Self-directed
13. Mixed, co-delivered fully by more than one type of provider (only use if fully co-delivered)
14. Intervention is structural, systemic, or environmental change (e.g. block scheduling, school restructuring)
99. Cannot tell

Who delivered the intervention? From the list above, select the focal provider. For interventions with more than one service provider, the focal provider is the individual who had the most contact with the participating youth (or parents for parent-oriented programs). If you cannot tell which of multiple delivery personnel types is focal or the multiple types of personnel appear equal, flag the study for discussion so that decision rules can be made moving forward.

Delivery Timing. When was the intervention delivered?

1. During regular school hours (does not have to be a school setting)
2. After school
3. Evenings and/or weekends
5. Other
6. Mixed
9. No information provided

Primary format of treatment sessions. The primary emphasis of this question is on who was present with the treated individuals during treatment sessions. *Check all that apply.*

1. Subject alone (self-administered treatment, e.g., bibliotherapy; nobody else is present but the subject)
2. Subject and provider, one on one
3. Group of subjects with provider, not a classroom setting (e.g., group therapy session)
4. Student group, classroom setting
5. Parents only with provider, child not present
6. Group of parents with provider, children not present
7. Parents alone (self-directed)
8. Child and parent(s) together with provider
9. Group of families (parents and children) with provider
10. Child and parent(s), no provider
11. Treatment professionals, teachers, school staff only; children not present
12. Service (e.g., peer mediation, volunteering)
13. Systemic program; no format (e.g., media interventions, school-wide reforms that don't involve direct services to any students or influential others)

Primary format of treatment sessions. Select one focal format from the list above. If the intervention involves multiple formats, select as focal the one that involved the most amount of time. If there are multiple formats with equal time or you cannot determine the focal format, flag the study for discussion.

Implementation Strategies and Challenges

Did the provider or treatment personnel receive <u>special</u> training in this specific program, intervention, or therapy prior to the beginning of the intervention?

1. Yes
2. No
9. No information provided

Is there evidence of ongoing supervision, consultation, coaching, booster sessions, debriefing, or other forms of support during the intervention for the treatment providers delivering the intervention? This would include provision of feedback to providers based on observations by the research team.

1. Yes
2. No
9. No information provided

Based on specific data or author discussion, was there a drop or reduction in the desired level of implementation that was achieved? Did the authors discuss any problems in program implementation that might have been caused by such things as high dropouts, erratic attendance, treatment not delivered as intended, staff turnover or burnout, staff caseloads, administrative issues, wide differences between settings or individual providers, etc.?

1. Yes, program implementation problems were evident (describe below)
2. Possible problems (describe below)
3. No, implemented as intended (must have a clear statement)
4. Level of implementation not reported

Based on specific data or author discussion, were there issues with the implementation of the research design? Did the authors discuss any problems with low consent rates or crossover/contamination between treatment and comparison groups? Were some participants excluded from analysis for reasons not consistent across groups?

1. Yes, research implementation problems were evident (describe below)
2. Possible problems (describe below)
3. No, implemented as intended (must have a clear statement)
4. Level of implementation not reported

Participant Characteristics

Presenting problem. Identify the primary presenting problem of the participants upon entering the program.

1. None. General population sample, no indication that participants entered the program because of a specific issue or problem.
2. Problems or negative behaviors in participating child/youth, including aggressive behavior, delinquency, ADHD, bullying, and the like.
3. Family relationships, including general family relationships, family functioning, and the like
4. Peer relationships, including friendships, peer rejection, social isolation, etc.
5. Academic or school performance, such as achievement, attendance, tardiness, grade retention, etc.
6. Other: _____
7. Multiple problems spanning above categories: _____
9. No information provided.

Gender mix of youth in this group.

1. No males (<5%)
2. Some males (<50%)
3. 50% to 60% male
4. Mostly males (>60%)
5. All males (>95%)
9. Cannot tell

Predominant ethnicity (60% or more) of the subjects in this group.

1. White
2. Black
3. Hispanic (Latino)
4. Other Minority
5. Mixed, none more than 60% or cannot estimate percent
9. Cannot Tell

Socioeconomic status: _____

Describe any details provided in the study report about the participants' socioeconomic status. This might include statements about a "white middle class community" and the like, or may involve explicit scoring of parents' occupations. You should copy or closely paraphrase the information directly from the study reports.

Participant age. Record any age-related information provided about the sample.

Enter the average age of the sample using number of years.
Enter the average grade level of the sample.

Enter the lowest age using number of years.
Enter the highest age using number of years.

AND

Enter the lowest grade level.
Enter the highest grade level.

Grade level.
1.   Pre-Kindergarten
2.   Elementary school
3.   Middle school
4.   High school
5.   Mixed grade levels
9.   Cannot tell

Methodological Characteristics

Unit of group assignment. The unit on which assignment to groups was based.

1.   Individual (i.e., some children assigned to treatment group, some to comparison group)
2.   Group (i.e., whole classrooms, schools, districts, therapy groups, sites, residential facilities assigned to treatment and comparison groups)
9.   No information provided

Method of group assignment. How participants/units were assigned to groups. This item focuses on the initial method of assignment to groups, regardless of subsequent degradations due to attrition, refusal, etc. prior to treatment onset. These latter problems are coded elsewhere.

1.   <u>Random or near-random assignment</u>

       This includes the following methods of assignment:
       •   Randomly after matching, yoking, stratification, blocking, etc. The entire sample is matched or blocked first, then assigned to treatment and comparison groups within pairs or blocks. This does not refer to blocking after treatment for the data analysis.
       •   Randomly without matching, etc. This also includes cases when every other person goes to the control group.
       •   Regression discontinuity design: quantitative cutting point defines groups on some continuum (this is rare-please refer to PD if you see an RDD).

2. Non-random, but matched

- • Matching refers to the process by which comparison groups are generated by identifying individuals or groups that are comparable to the treatment group using various characteristics of the treatment group. Matching can be done individually, e.g., by selecting a control subject for each intervention subject who is the same age, gender, and so forth, or on a group basis, e.g., by selecting comparison schools that have the same demographic makeup and academic profile of treatment schools.
- • Includes the following matching techniques:
  - o Matched ONLY on pretest measures of some or all variables used later as outcome measures.
  - o Matched on pretest measures AND other personal characteristics, such as demographics.
  - o Matched ONLY on demographics: big sociological variables like age, sex, ethnicity, SES.

3. Non-random, not matched, but pretreatment equivalence information is available

- • No matching prior to treatment but descriptive data, etc. regarding the nature of the group differences.

9. No information provided

Control or Comparison Condition. What do subjects in the control or comparison group receive?

1. Placebo (or attention) treatment. Group gets some attention or sham treatment (e.g., watching Wild Kingdom videos while treatment group gets therapy).
2. Treatment as usual. Group gets "usual" handling instead of some special treatment.
3. No treatment. Group gets no treatment at all.

Context of comparison group. Are comparison group participants in the same institutional context as the intervention participants? For example, if treatment kids are pulled out of class, are control kids also pulled out for, e.g., an attention placebo condition, or do they remain in their usual classrooms?

1. Yes
2. No
9. No information provided

Program Content Elements

The following section shows the full coding scheme for content elements. Elements were coded as present/absent for each program and are not mutually exclusive. An intervention element is defined as a discrete, reliably identifiable technique or strategy, which (a) is used as part of a larger intervention or prevention program, (b) is intended to influence the behavior or well-being of a service recipient, and (c) cannot be further subdivided without being rendered inert. Both content and process elements were recorded for each intervention.

Behavioral

Relaxation skills training. For example, meditation, breathing exercises, imaging peaceful scenes. Includes mindfulness activities and yoga.

Appropriate classroom behavior. For example, learning when it is appropriate to raise your hand, take turns speaking, paying attention to instructors, how to contribute to an orderly classroom environment (i.e., not creating distractions).

Cognitive/cognitive restructuring

Problem-solving sequence. Identify problem, think of alternatives, consequences, monitor outcomes. Not anger related.

Empathy. Activities focused on perspective taking and empathy. Children are taught to think about how other people would feel in a given situation.

Attribution retraining/Cognitive coping skills for stress. For example, children experiencing divorce (understanding that the divorce is not their fault). Attribution re-training for internal attributions of success and failure, understanding that there are both healthy and unhealthy attributions. Note: Rational Emotive Therapy/Rational Emotive education would be coded here, characterized by a model for changing irrational beliefs into rational ones (i.e., changing the way someone responds to stress or an unpleasant event by changing their thoughts about that event).

Moral development training/moral dilemmas.

Self-statements to inhibit impulsive behaviors or promote positive behavior. (not anger related) Self-instruction and self-talk can all be coded here.

Executive functioning skills training. Activities designed specifically to promote executive functioning in target children. For example, gross motor activities like Red Light, Green Light or Simon says that require impulse control, and visuomotor or visuospatial tasks like recreating a model or copying a design. Strategies for controlling anger impulses would be coded under anger management.

Interpersonal and social skills

Interpersonal social skills. Friendship, peer group interaction skills, affiliation with prosocial peers, prosocial skills, family relationships, general communication and active listening skills.

Conflict resolution, social or collaborative problem-solving skills. (how to solve problem together with peers)
Note: "Social problem-solving" is often used to describe a cognitive problem-solving process. If so, code under cognitive rather than interpersonal.

Assertive communication skills, how to resist peer pressure. Includes assertiveness without aggression

Identifying, understanding, and communicating feelings and emotions. However, identifying feelings and emotions as the first step of cognitive problem-solving sequence should be coded as cognitive problem-solving sequence. This can include drawing attention to feelings, but attribution retraining program should not be coded here.

Personal development and relationship support

Personal/individual development. Self-concept, self-confidence, values clarification/"life creed," goal-setting/future orientation, decision-making skills. Includes investment and engagement in school.

Trusting relationship with a caring adult. Often found with mentoring programs and youth development programs.

General personal or social support. Peer support groups or discussion groups where no specific skills are taught, or individual counseling (by licensed professional) where no specific skills are taught.

Anger management

Behavioral coping skills for anger/aggression. Includes behavioral impulse control (overt motor responses e.g., placing fist over mouth, hands tucked under arms) and distraction techniques (e.g., push-ups, timeouts, walking around).

Problem-solving sequence for managing anger/aggression. Identify problem, think of alternatives, consequences, monitor outcomes

Attribution training or retraining. Learning to recognize accidental causes in interactions with peers to minimize aggressive responses.

Self-statements to inhibit anger or aggressive behavior. Self-instruction and self-talk can all be coded here.

Angry behavior cycle/provocation cycle. Identify cues/triggers for angry behavior- your own or others. Emphasis on understanding triggers and possibly physical response. If there is focus on alternative responses, you may also consider coding as behavioral coping skills for anger/aggression.

Content for caregivers and families

Parenting skills. (e.g., positive discipline skills, communicating with child)

Parent functioning and well-being. (e.g., coping with stress, self-care)

Social support; skills for building support network.

Family communication skills, family problem-solving skills, family interactions.

Engagement/communication with child's school.

Information provision for families. Education on child development, health information (sex education, ADHD) etc.

Other content categories

Academic/educational. Includes the following types of programs (provided for reference, but are not sub-elements to code).
- Tutoring; homework assistance; test-taking skills; study skills
- Academic monitoring. Includes attendance, homework, performance monitoring.
- Field trips in educational context.
- Remedial education
- GED preparation
- College focused (e.g., academic advising, summer/weekend programs, application assistance)

School structure. Class or grade reorganization, small class size, alternative school, school-level policies. This content element may not have an associated process element.

Service learning. Engaging in community service projects or volunteer roles to benefit community or school. This content element may not have an associated process element.

Self-sufficiency skills. Daily living and personal management (distinct from social skills).

Health education and promotion. Personal hygiene, nutrition, STIs, etc.

Provide basic needs. Medical and dental exams, screenings, etc.

Recreational activities, music, and art. Sports/athletics, games, field trips (other than educational), adventure-based activities, summer camps, arts & crafts, music, general recreation, etc. This can be coded with process unspecified if little information is provided. If it's used as a strategy for keeping participants engaged, can code process element as other engagement strategies.

Employment/vocational/job readiness. Supervised work programs, job placement, career counseling, job or vocational training.

Case management or service brokerage. Includes assessment of need and referral provided by an agency, individualized treatment plans, and case management services when all participants are receiving different customized services. This content element may not have an associated process element.

Parenting skills for youth. Parenting skills that are taught to youth (could be teen parents or youth that are not currently parenting).

Content unspecified. Use for process elements with no clear content (for data management purposes).

Violence and Drug Use Education. Drug and substance use education, education on gang involvement and consequences of violent and criminal behavior. Includes field trips to prisons and ride-alongs with police members.

Process Elements

For each intervention, we also recorded any process elements, which are the active techniques or mechanisms through which a service provider delivers content elements and supports the behavior change process.

Access/Retention/Engagement Strategies: Any strategy designed to support or encourage participation in, or with, a practitioner, program or service.

> *Engagement-Behavioral strategies* targeting engagement or retention. For example, rewards for adhering to group rules or attending sessions. Includes both positive and negative reinforcements.

> *Removing barriers* to participation, e.g., providing childcare, transportation support, meals during sessions.

> *Reminders* to attend meetings or sessions

> *Other engagement strategies* to engage or motivate participants (non-behavioral).

Instructional or Pedagogical Strategies: Instructional or pedagogical techniques are process elements through which information is imparted and skills are built. The recipients of the information may be passive or active participants in the instructional activities.

> *Lecture, seminar, instruction (live or not live).* Instruction can be delivered to individuals, may be academic tutoring or the material delivered is the same for all participants. This is distinct from an individualized therapeutic approach.

> *Group discussion/interaction* – peer, family, or other

> *Modeling (live)*

> *Modeling (or video)*

> *Role play, behavioral rehearsal and feedback, trying new skills*

> *Experiential learning.* Development of knowledge, skills, or values from direct experiences or "hands on" learning (e.g. apprenticeship/internships)

> *Self-evaluation/reflection/self-monitoring.* The process of reflecting on content learned on one's own, may include journaling, logs, and diaries. If reflection occurs during group discussion, code as group discussion. This should not be used when there is self-monitoring as part of the problem sequence, self-statements, role play, or modeling.

> *Self-directed learning.* Content is delivered via a self-directed format (e.g. a workbook sent home, online/computer sessions where the content is taught through the software, not by a person). Self-directed activities to reinforce content learned previously should be code as homework.

Behavioral Strategies

> *Behavior modification – positive reinforcement.* Techniques that reward (e.g., token economy, stickers, small toys) for desirable behaviors targeted by the intervention. Note: some token economies might combine positive reinforcement w/ negative punishment.

> *Behavior modification – negative or positive punishment.* Techniques that discourage undesirable behavior by taking away something valued or adding a negative consequence. (e.g., time out, grounding, detention, adding more rules & restrictions, extra chores or homework, reprimanding)

Counseling Strategies. These should be therapeutic relationships (with licensed/trained professional not layperson or peer)

> *Reality therapy.* Specific type of therapy that emphasizes changing behavior rather than feelings; and focuses on the present and future, while avoiding discussing past events.

> *Individual counseling*, e.g., cognitive behavioral therapy, psychotherapy (other than reality therapy) for youth or parents.

> *Motivational interviewing.* A goal-oriented, client-centered counseling style for eliciting behavior change by helping clients to explore and resolve ambivalence.

> *Group counseling.* Group therapy for peer groups, parent groups, and groups of families (multi-family).

> *Family counseling* (individual families).

> *Mediation.* Counselor mediates/arbitrates between parties in conflict.

Support groups for youth or parents/caregivers (can be facilitated by layperson)

Mentor provided for youth (adult layperson)

Peer-Driven Strategies

Peer mediation - recipient of services.

Peer mediation - serving as mediator.

Peer mentoring/counseling - recipient of services. Format can be with individuals or group. Includes peer facilitators.

Peer mentoring/counseling - serving as mentor/counselor to an individual or group. Includes peer facilitators.

Peer tutoring/education – serving as tutor or educator of academic and other content.

Positive Peer Culture (specific approach where youth assume responsibility for helping one another and hold each other accountable)

Peer tutoring/education – recipient of peer educator of academic and other content.

Supporting Change: Refers to elements that support child or parental behavior change.

Homework. Tasks given to client(s) to complete outside of session(s) to improve treatment adherence or reinforce/facilitate new knowledge or skills that are consistent with the intervention.

Referrals to other services

Program Integration. Efforts by the program to reinforce content in other spheres of the child's life with the goal of this continuing on after the intervention. E.g., communication, conferences, or trainings with a parent/school staff to integrate content from the intervention in home or school life.

Process unspecified. Use for process elements with no clear content (for data management purposes).

Appendix B. Analytic Methods

This paper focuses on the self-regulation outcomes in the larger database. These outcomes were recorded from the research studies as standardized mean difference effect size statistics (*d*) calculated as the post-intervention differences in self-regulation between the intervention and control groups, divided by the pooled standard deviation of the groups. Cox transformations were applied to effect sizes based on dichotomous outcomes as outlined by Sánchez-Meca and colleagues (2003). All effect sizes were multiplied by the small sample correction factor (Hedges, 1981), $1 - (3/4n-9)$, where n is the total sample size for the study, and each was weighted by its inverse variance in all computations. The inverse variance weights were computed using the subject-level sample size for each effect size. Because many of the studies used groups (e.g., classrooms, schools) as the unit of assignment to intervention and control conditions, they involved a design effect associated with the clustering of students within classrooms or schools that reduces the effective sample size. We calculated the total cluster-adjusted sample size using an intra-cluster correlation coefficient (ρ) of 0.1 (Borenstein et al., 2009; Hedges, 2007).

Examination of the effect size distribution identified a small number of outliers with potential to distort the analysis; these were Winsorized to less extreme values using Tukey's inner fences. In addition, several studies had unusually large samples. Because the inverse variance weights chiefly reflect sample size, those few studies would dominate any analysis in which they were included. Therefore, the extreme tail of the sample size distribution was Winsorized using the Tukey fences for skewed distributions.

Many studies provided data sufficient for calculating mean difference effect sizes on the outcome variables at the pretest. In such cases, we adjusted the posttest effect sizes by subtracting the pretest effect size value.

Handling Dependent Effect Sizes

Studies often reported multiple effect sizes in the self-regulation outcome domain. These multiples came in several forms. In some cases, studies reported effect sizes for more than one type of self-regulation (impulsiveness, anger control, attention, persistence). In other cases, studies reported the same type of outcome but from different informants (e.g., parents, teachers). The multiple effect sizes were similar enough within study that we elected to retain the multiples in the analyses for this report. To account for the statistical dependencies that result from having multiple effect sizes from the same study sample, we used multi-level meta-regression models for all analyses (Konstantopoulos, 2011; Viechtbauer, 2010). Indicators for the different type of self-regulation outcomes and informant were tested in the methods analyses reported below.

Missing Data

Some studies were missing data on the method, participant, or program variables used in our analysis. Most variables had fewer than 10% of cases missing. To permit us to use the full sample of studies in our analysis, we imputed missing values for moderators, accounting for the multi-level structure of the data, with the 'mice' package (van Buuren & Groothuis-Oudshoorn, 2011) in R (4.0.3). We produced 20 imputations with this method. All analyses reported in this paper were run on the 20 imputed datasets and aggregated. Degrees of freedom and standard errors were adjusted to account for the uncertainty introduced by the imputation process per Barnard and Rubin (1999).

Selection and Recoding of Moderators

For analysis, most moderators were recoded into dummy codes or categorical variables with fewer categories than the coded version. The descriptive statistics for variables used in the analysis are presented as appropriate in each chapter. We selected moderators based on the magnitude of their bivariate correlations with effect size. When multiple moderators that were conceptually similar were available, we generally selected the moderator that had the strongest relationship with effect size.

The meta-analytic database includes a large number of potential core components, many more than we could explore in a single analysis. To select moderators for analysis, we used a combination of strategies. First, we examined the bivariate correlations of each moderator with the effect sizes as well as the intercorrelations among the moderators. For those variables with correlations larger than r=.10 that had sufficient variability (i.e., moderators for which only a few studies had the feature were not explored), we performed a form of random forest analysis designed for meta-analytic data (Hapfelmeier & Ulm, 2013; van Lissa, 2018). Random forest analysis is a method for selecting moderators for regression analysis using machine learning techniques; this technique explores the strength of the relationships of each potential moderator with the effect sizes while taking into consideration the relationships of each moderator with the others. One result of a random forest analysis is a variable importance plot that identifies the moderators' association with the effect sizes while taking into account the intercorrelations. Potential core components that were identified as important in the random forest analysis were entered into meta-regression models.

Rather than relying on statistical significance, which we felt would cause us to overlook substantively meaningful relationships, moderators were retained in the final meta-regression models based on a threshold of .10 effect size units. Binary core components were considered to have a meaningful relationship with effect sizes if their independent contribution to predicting effect sizes (the regression coefficients, or *b*s, in the models) was 0.10 or larger. Other variables were standardized for analysis to make the regression coefficients more interpretable.

Data Analysis

All analyses were inverse variance weighted using random effects statistical models that incorporate both within-study and between-study sampling variance estimates into the study level weights. The between studies variance component (τ^2) was estimated using restricted maximum likelihood. Random effects weighted mean effect sizes were calculated for all studies using 95% confidence intervals. Estimates of Cochrane's Q, I^2, and τ^2 were used to assess heterogeneity in the effect sizes. The regression analyses reported in this paper were performed using the 'metafor' package in R (Viechtbauer, 2010). Functions for applying *metafor* with multiply imputed data were developed by Ariel Aloe and Seohee Park (2020).

Appendix C. Analysis of the Influence of Method Variables

The meta-analytic database includes a wide range of variables relating to study methods and research procedures, some of which are associated with effect sizes. These variables cannot serve as potential core components but must be addressed in the analysis to ensure that the substantive relationships we explored earlier are not overly attenuated or obscured by the influence of the method variables. Descriptive statistics for the major method variables in the dataset are presented in Exhibit C1.

Exhibit C1.   Study Methods & Research Procedures for All Studies in the Core Components Analysis (k=327; n=1048)

	Frequency (%) of Studies or Mean (sd)
Between Study Methods Variables	
Individual random assignment	149 (46%)
Cluster random assignment	91 (28%)
Quasi-experimental design	87 (27%)
Publication type = journal article (vs. Dissertations and other)	219 (67%)
Role of evaluator in study	
Delivered interventions	89 (27%)
Involved in planning	197 (60%)
No direct role in providing services	41 (13%)
Type of comparison group	
No service	60 (18%)
Usual service	220 (67%)
Minimal service	47 (14%)
Within Study Methods Variables	**Frequency (%) of Effect Sizes**
Total sample size (Winsorized)	103 (89)
Subdomain of Self-Regulation Measured	
Impulsiveness, self-control	359 (34%)
Attention problems and hyperactivity	327 (31%)
On-task behavior, task orientation, persistence	123 (12%)
Performance measures of cognitive self-regulation	124 (12%)
Planful behavior, goal setting, responsibility	115 (11%)
Informants	
Target youth, self-report	416 (40%)
Parent	209 (20%)
Teachers	323 (31%)
Observers	55 (5%)
All others	45 (4%)

How Method Variables Affect the Substantive Analyses

We now present a series of regression models in which we explore the method variables for each intervention family. The purpose of this exercise is to examine whether including method variables in the models leads us to doubt the relationships we see between our core components and program impacts. In each exhibit, Model 1 shows the most important method variables for the respective intervention family alone. Model 2 adds the core components we identified in the analyses presented earlier. As we expected, the methodological characteristics of the studies in the meta-analysis are associated with the findings. However, adding the method variables to the core components does not appreciably change the independent relationships of our core components to the effect sizes. Although the size of the coefficients for our core components does change when method variables are added, the direction of the relationships remains. Therefore, the fact that the method variables do not contradict our findings gives us confidence that the relationships of the core components to program impacts are robust.

Exhibit C2.   Method Variables Analysis for Universal Skill-building Interventions (k=125; n=346)

	Model 1			Model 2		
Method Variables	**b**	**se**		**b**	**se**	
Intercept	0.41	0.03		0.29	0.06	
Routine practice program (vs. research and demonstration programs)	-0.15	0.05	**	-0.11	0.05	†
Type of self-regulation = attention problems and hyperactivity[a]	-0.15	0.05	†	-0.14	0.05	*
Type of self-regulation = off-task behavior, task orientation[a]	-0.12	0.04	**	-0.10	0.04	
Informant = teachers	0.13	0.07	**	0.15	0.07	**
Core Components						
Delivered in a pull-out school or community setting (vs. in class)				0.16	0.06	*
Content Element: Problem solving sequence				0.06	0.14	
Model Statistics						
Q-model	23.09	***		27.84	***	
Q-residual	453.22	***		447.70	***	
τ^2 (between)	.01			.01		
τ^2 (within)	.05			.02		
I^2	49.39%			49.53%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
[a] Reference category includes impulsiveness, performance measures of self-regulation, and planful behavior

† p<.10, * p<.05, ** p<.01, *** p<.001

Exhibit C3. **Method Variables Analysis for Targeted Family Relations and Parenting Skills Interventions (k=27; n=89)**

	Model 1			Model 2		
Method Variables	**b**	**se**		**b**	**se**	
Intercept	0.21	0.41		0.38	0.28	
Design: Individual random assignment	-0.05	0.16		-0.11	0.11	
Comparison group level of service (higher scores = less service)	0.11	0.16		0.06	0.10	
Publication type = Journal article	-0.16	0.22		-0.23	0.18	
Informant = Parents	0.25	0.09	**	0.25	0.09	**
Core Components						
Delivery format: one-on-one				0.26	0.10	*
Content element: Behavior modification strategies				0.43	0.09	***
Implementation: Explicit or suggested problems				-0.25	0.09	**
Model Statistics						
Q-model	9.30	†		51.09	***	
Q-residual	407.70	***		293.17	***	
τ^2 (between)	0.07			0.00		
τ^2 (within)	0.10			0.09		
I^2	79.52%			67.70%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† p<.10, * p<.05, ** p<.01, *** p<.001

Exhibit C4. **Method Variables Analysis for Targeted Relational Interventions (k=28; n=50)**

	Model 1			Model 2		
Method Variables	**b**	**se**		**b**	**se**	
Intercept	0.75	0.30		0.87	0.38	
Research design = QED	-0.27	0.20		-0.29	0.21	
Informant = Teachers	-0.11	0.08		-0.10	0.08	
Role of evaluator: Delivered intervention or closely involved	0.14	0.16		0.03	0.17	
Comparison group level of service (larger values = less service)	-0.16	0.14		-0.19	0.16	
Core Components						
Frequency of sessions per week				0.16	0.07	*
Delivery personnel = Mental health professionals				0.03	0.16	
Implementation: Explicit or suggested problems				-0.18	0.17	
Model Statistics						
Q-model	6.45			12.55	†	
Q-residual	75.05	**		63.11	*	
τ^2 (between)	0.07			0.06		
τ^2 (within)	0.00			0.00		
I^2	54.96%			52.45%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† p<.10, * p<.05, ** p<.01, *** p<.001

Exhibit C5. Method Variables Analysis for Targeted Skill-building Interventions (k=77; n=382)

	Model 1			Model 2		
Method Variables	**b**	**se**		**b**	**se**	
Intercept	0.16	0.10		-0.23	0.13	
Design: Individual random assignment	0.02	0.09		-0.02	0.09	
Publication type: Journal article	0.11	0.10		0.10	0.09	
Informant = Parents	0.20	0.04	**	0.21	0.04	***
Core Components						
Implementation: No problems or no problems mentioned				0.23	0.09	*
Provider supervision=Yes				0.09	0.07	
Program modified or not scripted (vs. delivered according to script)				0.15	0.08	†
Content element: Relaxation skills training				0.21	0.09	*
Process element: Modeling *and* role play, rehearsal, practice				0.16	0.08	†
Model Statistics						
Q-model	24.45	***		42.58	***	
Q-residual	737.22	***		571.18	***	
τ^2 (between)	0.08			0.06		
τ^2 (within)	0.01			0.01		
I^2	55.10%			46.23%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† p<.10, * p<.05, ** p<.01, *** p<.001

Exhibit C6. Method Variables Analysis for Targeted Behavior Management Interventions (k=24; n=59)

	Model 1			Model 2		
Method Variables	**b**	**se**		**b**	**se**	
Intercept	0.56	0.26		0.65	0.23	
Design: QED	-0.13	0.20		-0.27	0.18	
Publication type = Journal article	-0.21	0.25		-0.58	0.23	*
Type of self-regulation: Attention problems and hyperactivity	0.12	0.11		0.03	0.11	
Specific Effectiveness Factors						
One-on-one format				0.40	0.13	**
Content Element: Focus on appropriate classroom behavior				0.04	0.13	
Model Statistics						
Q-model	2.06			18.67	**	
Q-residual	79.93	*		56.50		
τ^2 (between)	0.05			0.00		
τ^2 (within)	0.00			0.00		
I^2	40.33%			0.00%		

Note. k=number of studies; n=number of effect sizes. The table reports unstandardized regression coefficients (b) and standard errors (se) from inverse variance weighted multi-level random effects meta-regression analyses using REML estimation.
† p<.10, * p<.05, ** p<.01, *** p<.001

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References for the Studies in the Meta-Analysis

The studies from the larger meta-analytic database examined in this paper are listed below and organized by our internal study identification numbers. These numbers are arbitrary and serve only to identify the different studies in the database and the (often) several articles or reports that comprise each study.

StudyID   **Reference**

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StudyID	Reference

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