Review of Educational Research
Month 201X, Vol. XX, No. X, pp. 1–37
DOI: 10.3102/0034654320914743
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A Meta-Analytic Review of Preschool Social and Emotional Learning Interventions

Dana Murano
ACT, Inc.

Jeremy E. Sawyer
Kingsborough Community College, City University of New York

Anastasiya A. Lipnevich
Queens College and the Graduate Center, City University of New York

This meta-analysis summarized the effects of universal and targeted social and emotional learning (SEL) interventions in 48 studies on the development of social and emotional skills and the reduction of problem behaviors in 15,498 preschool students. For universal SEL interventions delivered to all students, a random-effects model with 33 primary studies showed small to medium effects for the overall development of social and emotional skills (Hedges's g = .34) and for the reduction of problem behaviors (g = .32), with an overall grand mean of g = .35. For targeted interventions, delivered to at-risk students identified as being in need of additional supports, a random-effects model with 15 primary studies showed medium effects for the overall development of social and emotional skills (Hedges's g = .44) and for the reduction of problem behaviors (g = .50), with an overall grand mean of g = .48. A meta-regression model showed that intervention program accounted for 83% of heterogeneity in the overall effect size for universal interventions. Overall, this meta-analysis demonstrated that preschool children benefit from SEL interventions in different contexts, particularly those who were identified as being in need of early intervention. Moreover, best practices for preschool SEL interventions may differ from best practices for K–12 students, given the developmental uniqueness of the preschool years.

Keywords: meta-analysis, preschool, social and emotional learning (SEL), interventions

In recent years, it has become virtually undisputed that students need to acquire more than cognitive skills to succeed in school and beyond. Some of the most important skills in this regard are social and emotional skills. Social and emotional skills include interpersonal and intrapersonal skills that enable students to

understand and manage their emotions, set and achieve positive goals, feel and show empathy for others, establish and maintain positive relationships, and make responsible decisions (Collaborative for Academic, Social, and Emotional Learning [CASEL], n.d.). Social and emotional learning (SEL) intervention programs designed to bolster these skills in children have grown increasingly popular in the past 20 years (Weissberg et al., 2015). SEL interventions are commonly implemented during school and in after-school contexts from preschool through 12th grade, both universally (i.e., the intervention is delivered to all students) and in targeted contexts, in which only students who are identified as being in need of additional supports receive the intervention (Humphrey, 2013; Zins et al., 2004). SEL interventions have demonstrated positive proximal outcomes, such as the development of student social and emotional skills, as well as positive distal outcomes, such as improved academic performance, decreased problematic behavior, and increased school completion (e.g., Hagelskamp et al., 2013; Jones & Bouffard, 2012; Weissberg et al., 2015).

Development of Social and Emotional Skills in Preschool

Efforts to develop social and emotional skills during the preschool years can be beneficial to children's overall development and school-readiness (e.g., Jones & Bouffard, 2012; McClelland et al., 2017). Social and emotional skills in preschoolers have been tied to a variety of desirable proximal outcomes. Denham et al. (2014) found that self-regulation, emotion knowledge, social problem solving, and social-emotional behavior positively predicted classroom adjustment and academic success among preschoolers. Arnold et al. (2012) demonstrated that positive social functioning in preschool, indicated by low aggression and prosocial skills, was linked to enhanced academic achievement. In addition to academic success, preschool children with high social and emotional competence develop more friendships, have better relationships with parents and teachers, and engage in more interactions with peers (McCabe & Altamura, 2011; Rose-Krasnor, 1997). Distal outcomes are also positively predicted by preschool social and emotional skills. Knowledge of emotions and interpersonal relationships in preschool predict academic achievement in kindergarten (Torres et al., 2015), and positive preschool relationships are associated with higher adjustment and achievement in kindergarten (Bagdi & Vacca, 2005). These studies show that social and emotional skills can indeed be developed in preschool, and additional research shows the social and emotional skills are tied to positive outcomes particularly for children living in poverty (Masten & Coatsworth, 1998).

Preschool SEL Interventions

Employing various theoretical approaches, many SEL interventions aim to bolster the development of social and emotional skills in preschoolers. Some popular interventions include Tools of the Mind, PATHS, I Can Problem Solve, and The Incredible Years (Bierman & Motamedi, 2015). SEL programs feature different content depending on their theoretical foundations. For instance, Tools of the Mind is rooted in Vygotskian theory on self-regulation, and thus promotes sociodramatic play and private speech to build this capacity (see Farran et al., 2011). I

Can Problem Solve is based on social information-processing theory, wherein children and adults work together in order to identify social goals and responsible behaviors that will help students achieve these goals. Though a complete review of the theoretical foundations of individual programs and their mechanisms is beyond the scope of this review, interested readers can consult Bierman and Motamedi (2015) and White et al. (2017).

Teachers often play pivotal roles in delivering SEL interventions to preschool-aged children. In particular, teachers often deliver universal SEL interventions that are geared toward all students (Tier I interventions) in classroom settings (see Humphrey, 2013). Programs that train teachers to deliver the interventions to preschoolers have been effective in developing student-level social and emotional skills (Lynch et al., 2004; McCabe & Altamura, 2011; McLeod et al., 2017). Train-the-teacher models include explicit coaching for teachers, classroom climate strategies, and curriculum resources. Factors associated with successful teacher implementation of SEL curricula include sociocultural awareness and cultural relevance (Garner et al., 2014), positive teacher attitudes toward SEL (Aubrey & Ward, 2013; Zinsser et al., 2014), strong teacher social and emotional competence (Jennings & Greenberg, 2009; Zinsser et al., 2016), and school administrator support for implementation (Papadopoulou et al., 2014). Indicators of teachers' social and emotional competence involve enacting prosocial values, demonstrating respect for students and taking responsibility for one's actions, displaying warmth and empathy in relationships with students (Roorda et al., 2011), and utilizing high social, emotional, and cultural awareness (Jennings & Greenberg, 2009).

Parents are also critical stakeholders and participants in the development of preschoolers' social and emotional skills. Training programs in which parents are trained in behavior management and other techniques to develop student social and emotional skills have been shown to be effective in minimizing disruptive behavior and developing social and emotional skills in children (e.g., Bierman & Motamedi, 2015; Carr et al., 2017; Gross & Grady, 2002). In the preschool years, parents are particularly integral in delivering targeted interventions (Tier 2 or Tier 3) to students who have been identified as needing additional supports (see Humphrey, 2013). Many of these programs are rooted in social cognitive theory in that learning occurs via modeling, relationships, and interactions between parents and their children. The most effective parent programs appear to be those that have theoretical, empirical, and administrative support; are flexible in accommodating parents in order to promote involvement; have competent facilitators; and are culturally and contextually relevant (Gross & Grady, 2002). All in all, optimal developmental conditions would be expected to involve SEL support in multiple layers of children's lives.

In general, implementing such interventions during the preschool years is highly beneficial, given the accumulated evidence suggesting that early childhood is a sensitive period for multiple domains of development (e.g., Bierman & Motamedi, 2015; Goswami, 2004; Klibanoff et al., 2006; Raikes et al., 2006; Yoshikawa et al., 2013). Interventions implemented with preschoolers have also shown improved outcomes in cognitive (e.g., Kautz et al., 2014; Walker, 2011),

social (e.g., Camilli et al., 2010), and economic (Kautz et al., 2014) domains for children throughout their lifetimes, as well as high rates of return on investment (Kautz et al., 2014; Reardon, 2011). These findings suggest that interventions geared toward preschool-aged children may be particularly beneficial due to the developmental uniqueness of the preschool years.

Meta-Analytic Evidence for SEL Interventions

Among K–12 students, extensive meta-analytic evidence supports the effectiveness of SEL intervention programs in the development of social and emotional skills. In a review of studies including 324,303 kindergarten through eighth-grade students, participation in ongoing SEL programming showed positive effects on the development of student social and emotional skills, attitudes, and behaviors (Payton et al., 2008). Durlak et al. (2011) reviewed 213 school-based, universal SEL programs involving kindergarten through high school students and showed that students receiving SEL programming demonstrated significant improvements in social and emotional skills ($d = .57$), school attitudes ($d = .23$), positive social behavior ($d = .24$), and academic performance ($d = .27$), as well as decreases in conduct problems ($d = .22$), and emotional distress ($d = .24$). Durlak et al. (2011) found that the largest effect sizes stemmed from interventions that were delivered by school staff during the school day, implemented best practices for program delivery (curriculum was sequenced, active, focused, and explicit), and had adequate fidelity of implementation. Other meta-analyses have showed similar gains in social and emotional skills, academic performance, and behavior (Corcoran et al., 2018; Sklad et al., 2012). Gains from SEL interventions have also been found to last up to 2 years postintervention, though effect size magnitude decreased as increased amounts of time passed (Taylor et al., 2017). A recent meta-analysis with only kindergarten students showed the strongest effects for universal interventions that focused on behavioral training (Sabey et al., 2017). In this study, behavioral interventions showed the largest effects on the development of prosocial behavior and decreasing antisocial behavior compared with interventions that only targeted social or emotional development. Additional meta-analyses focusing on the development of discrete skills have also shown positive effects of social skills interventions ($d = .15$) and mindfulness-based interventions ($g = .32$) with school-aged children (January et al., 2011; Klingbeil et al., 2017).

Recent meta-analytic reviews of SEL interventions have focused primarily on universal programs delivered within K–12 contexts (Durlak et al., 2011; Payton et al., 2008; Taylor et al., 2017). The exception is Corcoran et al.'s (2018) recent analysis, which included six studies on preschoolers of the 40 included primary studies. This lack of meta-analytic evidence focusing exclusively on preschoolers substantially limits our understanding of how best to promote social and emotional skills during early childhood. Although there have been several large-scale systematic reviews on preschool programs that have drawn conclusions about best practices such as cultural relevance, teacher attitudes and competence, and implementation (e.g., Bayer et al., 2009; McClelland et al., 2017; McLeod et al., 2017; White et al., 2017), none have systematically combined outcomes from multiple samples through meta-analysis.

Present Study

This review will investigate the effects of SEL interventions delivered to preschool-aged children both in universal and in targeted contexts. In addition to universal SEL programs, we included targeted interventions because many preschool studies involved students who had been identified as at-risk or having higher needs than other students. Many SEL practitioners advocate intervening in organized, systematic ways with children who are identified as being in need of additional supports at young ages (Hoffman, 2009). These targeted interventions often involve parent training programs that aim to leverage parents in building children's social competence and decreasing problem behaviors. Thus, the current study systematically analyzed findings of both universal and targeted interventions, combining effects from single studies, aggregating findings across diverse samples and settings, examining potential moderators, and attempting to resolve any conflicting findings observed within single studies.

Primary Study Designs

Despite the promising evidence that SEL programs have yielded, a current weakness in the field is a lack of strong empirical support for many programs regularly implemented in the P–12 space. Although many interventions are strongly rooted in theory, very few programs have undergone rigorous empirical evaluation to document their effectiveness (e.g., Corcoran et al., 2018; Jagers et al., 2015). When such programs have been evaluated, these studies have often lacked control groups, and few have used high-quality designs such as randomized controlled trials (RCTs) to evaluate SEL curricula (Corcoran et al., 2018; Kautz et al., 2014). This has raised concern over what has been called the "garbage in, garbage out" predicament in meta-analysis (Cooper, 2017). In other words, there is growing apprehension that SEL evaluation studies with weak designs are being packaged together into meta-analytic reviews, thus diluting the quality of these reports (Corcoran et al., 2018). To address this issue, the present review included only primary studies of SEL programs that featured RCTs or quasi-experimental control group designs that sufficiently controlled for group differences. Acceptable quasi-experimental methods included propensity score matching, analysis of covariance (ANCOVA) to control for preexisting group differences, and the use of hierarchical linear models to model individual-level effects adjusted for the variance of the unit of randomization (i.e., school- or classroom-level randomization).

Outcome Measures

Both social and emotional skills and the reduction of problem behaviors were outcomes of interest in this study and were considered as separate outcomes. The social and emotional skills outcomes included discrete skills such as identifying emotions, interpersonal problem solving, social cooperation, and self-regulation, in addition to broader measures such as social competence and social skills. The reduction in problem behavior included outcomes that indexed decreases in externalizing and internalizing behaviors.

Outcome measures were recorded via multiple methods and came from multiple sources. We coded the source of each outcome measure as one of the following: student task measures, observer report measures, teacher-report measures, and parent-report measures. In terms of reliability, student task measures ranged from $\alpha = .57$ to .97; observer ratings ranged from $\alpha = .53$ to .96; teacher ratings ranged from $\alpha = .70$ to .97; and parent ratings ranged from $\alpha = .46$ to .95. Some instruments measured discrete skills (e.g., the Emotion Recognition Questionnaire is a student task measuring emotion recognition), whereas other instruments measured social and emotional skills more globally (e.g., the Social Competence Scale, a Likert-scale measure completed by the student's classroom teacher spanning multiple dimensions of social competence).

Moderators of Results

Based on prior research, several student-level, program-level, and methodological factors were identified a priori as potential moderators. At the student level, research has indicated that early intervention is generally most effective for children who have the least favorable environments for development; in many cases, this includes children growing up in low-income or high-risk homes (e.g., Center on the Developing Child at Harvard University, 2007). Therefore, socioeconomic status (SES) was included as a potential moderator, and we expected to see larger gains for low-SES participants than their higher SES counterparts. We also recorded age to determine whether participant age moderated outcomes. Additionally, for the universal program analyses, we coded potential risk factors (i.e., a majority-minority school, English language learner status, etc.) to determine whether universal interventions implemented in areas of greater need showed larger effects than universal interventions implemented with students with fewer needs and risk factors.

In terms of program delivery, Durlak et al. (2011) found that the setting in which interventions were delivered moderated effect sizes of outcomes; interventions delivered during the school day by school personnel showed the largest effects. We, therefore, included the setting in which the intervention was delivered (at school, after school, at home, or a combination of settings) and agents who delivered the intervention (teachers, parents, researchers, or a combination of parents and teachers) as potential moderators. Durlak et al. (2011) also found that fidelity of implementation moderated outcomes, with studies reporting fidelity issues showing smaller gains in outcomes. Whereas fidelity of implementation has been shown to be an important factor in the success of educational interventions (e.g., Domitrovich et al., 2010; Durlak & DuPre, 2008; Plass et al., 2012), it has only been considered in some SEL evaluation studies, with about 50% of primary studies neglecting to report fidelity data (Durlak et al., 2011).

Last, we hypothesized that methodological factors could moderate results. We expected that study design may relate to the size of effects reported in primary studies, with higher quality studies showing smaller gains, a hypothesis derived from Corcoran et al.'s (2018) findings. Additionally, we tested to see if the effect sizes from primary studies varied by method of measurement (i.e., other-informant reports, student tasks, and observer reports).

Objectives of the Review

In this meta-analytic review, we compiled and analyzed evidence for the effects of preschool SEL programs on preschoolers' social and emotional skills and behavior. The current review shared many inclusion criteria, exclusion criteria, and study objectives with Durlak et al.'s (2011) systematic review and meta-analysis of universal K–12 SEL interventions. However, our study differed from Durlak et al. (2011) in that it focused exclusively on preschool students. In addition, the current study included targeted interventions for students deemed at risk, which generally involved students demonstrating high levels of externalizing behaviors on various screener measures. These targeted interventions that consisted largely of parent-training programs were analyzed separately from universal interventions. Finally, the present meta-analysis set higher study design standards for inclusion by including only RCT and quasi-experimental designs with established baseline equivalence or adequate statistical controls.

The central purpose of this review was to aggregate evidence from rigorously evaluated SEL programs for preschoolers to determine the impact of SEL interventions on intended student outcomes. Hence, the review aimed at answering the following research questions:

1. What is the overall effect of universal SEL interventions on the development of social and emotional skills in preschoolers?
2. What is the overall effect of universal SEL interventions on the reduction of problem behaviors?
3. What is the overall effect of targeted SEL interventions on the development of social and emotional skills in preschoolers receiving targeted social and emotional programs?
4. What is the effect of targeted SEL interventions on the reduction of problem behaviors?
5. Do any of the following factors moderate gains in social and emotional skills and reductions in problem behaviors in universal or targeted intervention programs: program type; fidelity of implementation; duration of exposure to program, participant SES, age, or risk-status?
6. Do methodological aspects of study design (RCT, quasi-experimental) or measurement type (student task, teacher-report, parent-report, or observation) moderate the reported development of social and emotional skills and reduction of problem behaviors in universal and targeted interventions?

Method

In order to identify relevant studies reporting on the effects of SEL intervention programs in preschoolers, the following inclusion and exclusion criteria were used.

Inclusion Criteria

Studies with the following characteristics were included into our analyses:

1. Took place inside and outside of the United States, with a report accessible in English
2. Appeared in published or unpublished (including non-peer-reviewed papers such as dissertations and unpublished manuscripts) form by December 1, 2017
3. Involved exclusively preschool students receiving a universal or targeted SEL intervention that targeted the development of SEL skills as categorized by CASEL (self-management, self-awareness, social awareness, responsible decision making, relationship skills)
4. Included one of the following outcome measures during the preschool year: social and emotional skills (discrete skills involving self-management, self-awareness, social awareness, responsible decision making, or relationship skills), or reductions in problem behaviors
5. Included a control group
6. Employed an RCT design or rigorous (matched or statistically controlled) quasi-experimental design
7. Reported sufficient information so that effect sizes could be calculated at posttest

Exclusion Criteria

Studies with the following characteristics were excluded from the review:

1. Studies that did not specifically report on outcomes during the preschool years
2. Programs whose primary purpose was to promote achievement and academic gains via increased exposure to literacy and mathematics instruction, instructional strategies, or any form of cognitive skill intervention
3. Studies that focused primarily on outcomes related to physical well-being, such as healthy nutrition programs, nourishment, and gross or fine motor skill programs
4. Studies that used single-group, single-case, multiple baseline, or nonequivalent quasi-experimental designs; any designs that did not match participants or control for preexisting group differences (e.g., using ANCOVA or propensity score matching) were excluded

Literature Search

Three main strategies were used to locate studies for potential inclusion in the review. First, we conducted a search of Academic Search Complete, a cross-disciplinary database that contains the databases Education Source, ERIC, PsycARTICLES, PsycBOOKS, PsycCRITIQUES, and PsycINFO, and ScienceDirect. The search terms used included the following: *social emotional learning*, *SEL*, *psychosocial*, *social skills*, *empathy*, *emotion*, *problem solving*, *conflict resolution*, *coping*, *Al's Pals*, *HighScope*, *I Can Problem Solve*, *The Incredible Years, PATHS*, *Peace Works*, *Tools of the Mind*, *MindUP*, *Positive Action*, *Resolving Conflict Creatively Program*, and *Second Step*. These search terms were crossed with the age group of interest (*preschool**, *prek**), and type of

study that was sought: (*intervention*). The literature search was completed between November 9, 2017, and December 1, 2017.

Second, websites of organizations that promote SEL, such as CASEL, the Partnership for 21st Century Learning, and the OECD, were searched for any relevant reports on SEL intervention programs. Publication titles and research references from each CASEL-endorsed program's website were also retrieved and examined. This resulted in locating several conference papers and private reports that had been published outside of peer-reviewed journals.

Last, the snowballing method was used to find additional relevant studies from the reference sections of meta-analytic and systematic reviews. This also enabled us to find several private reports, which were retrieved by contacting authors and representatives from curriculum developers' organizations. Through these search methods, we have accessed relevant "gray literature," such as conference talks, unpublished manuscripts, dissertations, and book chapters that may be of relevance to the review (Rothstein, 2012).

Screening Procedure

Initially, 1,870 potentially relevant records were identified using the search terms and method listed above. After 120 duplicate records were removed, 1,750 articles were screened for eligibility using a researcher-designed eligibility screening form (see Supplemental Appendix A in the online version of the journal). Two hundred and seventy-one studies that met all requirements of the eligibility screening form were then retrieved as full text articles to be reviewed and potentially coded. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram in Figure 1 depicts the progression from studies that were initially identified to those included in the meta-analysis. Supplemental Appendix B (available in the online version of the journal) shows which full-text studies were excluded at the last stage of screening and their reasons for exclusion. At the end of this process, 48 articles (33 on universal interventions and 15 on targeted interventions) containing 57 separate studies were included in the meta-analysis.

Coding Procedure

A coding guide was devised with its sections organized in the following manner, following recommendations by Cooper (2017): identifying information for the study and its coder (Part I); a description of the study's SEL intervention (Part II); a description of the intervention (Part III); a description of the study's sample/participants (Part IV); and a description of study outcomes (Part V). Part III contained items needed to extract information about study design, and Part V was used to extract information needed to calculate effect sizes. The coding guide also included items to extract information about potential moderators (i.e., fidelity of implementation, intervention setting, etc.).

Based on previously documented difficulties with assessing study quality for meta-analytic review, such as incongruent quality ratings among different coders, and subjectivity surrounding the meaning of "quality" (e.g., Juni et al., 1999), ratings of study quality were not featured in the coding guide. Rather, inclusion and exclusion criteria were specified to include only relatively high-quality studies in

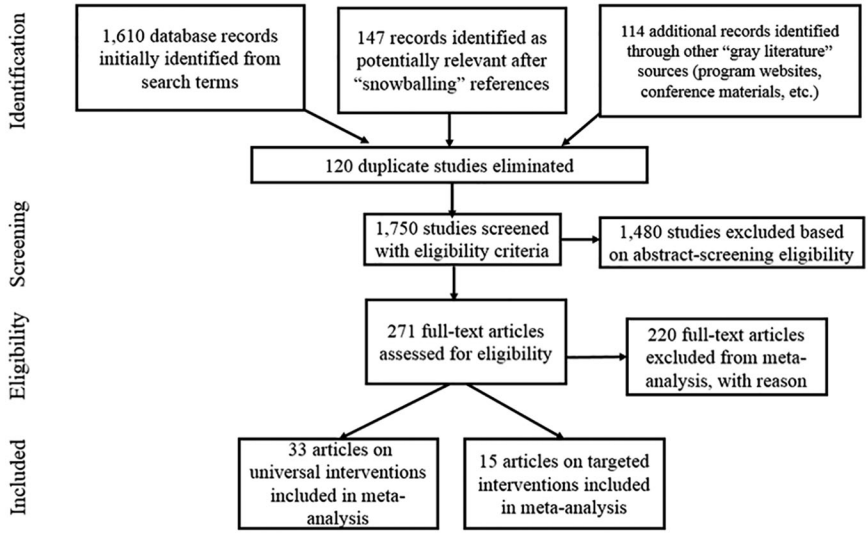

FIGURE 1. *PRISMA diagram of included studies.*

our meta-analysis from the beginning. Several of the more objective questions from Cooper's (2017) Design and Implementation Assessment Device (DIAD) guidelines were incorporated into the coding guide (e.g., was random assignment used, was there differential attrition, were intervention conditions known to participants or deliverers of the intervention). In terms of assessing bias, we followed the Cochrane Collaboration's tool for assessing the risk of bias in randomized trials (Higgins et al., 2011), and items in the coding guide were used to capture this as well.

The two first authors were the coders for included studies. The coders double-coded a subset of studies to determine interrater agreement, which was .93. All disagreements on coding forms were discussed between the two coders and resolved. The remaining 87% of studies were coded by only one of the two coders due to the high interrater agreement demonstrated. Supplemental Appendix C (available in the online version of the journal) contains the full coding guide used to extract information from the primary studies.

Statistical Method

From each primary study, standardized mean differences (Cohen's *d*) were either extracted or computed for each outcome of interest. Because all included studies were intervention studies, nested data structure was taken into account when extracting effect sizes from primary studies. When available, effect sizes from hierarchical linear models were extracted in order to account for cluster randomization. In studies using cluster randomization that reported outcomes at the individual level without the use of hierarchical linear modeling or a similar

procedure to correct effect sizes, reports were scanned for intraclass correlations (ICCs). ICCs can be used to generate a correction for the estimates of effect sizes and their variances, which are often underestimated as a result of cluster randomization and subsequent analyses of outcomes at the individual level (see Hedges, 2007). However, no primary studies reported sufficient ICC information to apply Hedges's (2007) effect size correction, so the correction could not be used. Overall, 11 studies reported effect sizes that accounted for the nested data structure, 15 studies did not employ a nested data structure (i.e., the unit of randomization and unit of analysis was the individual student level), and 22 studies remained uncorrected for the effect of the nested data structure. After all effect sizes were extracted or computed in the form of Cohen's *d*, Hedges's *g* was computed and used as the effect size metric for all analyses. Hedges's *g* was selected because it applies a correction to Cohen's *d* for small sample sizes; despite the correction, the magnitude of effect sizes can be interpreted similarly to Cohen's *d* (Borenstein et al., 2009).

From the 57 studies included in the meta-analysis, a total of 207 effect sizes were extracted. These resulted from multiple outcomes within the same study, as well as multiple types of measurement (e.g., a student task and a parent rating both measuring a student's emotion knowledge). To deal with these multiple effect sizes, multiple outcomes were entered for each study and then averaged. Measurement type (student task, parent report, teacher report, or observer rating) was entered as a subgroup, which allowed for outcomes to be additionally averaged by measurement methods of each study. Ratings considering the same skill from multiple measurement sources (i.e., both a parent report and a student task measure for interpersonal problem solving) were treated as independent ratings per outcome, and all mono-method ratings per outcome were averaged together to calculate one outcome rating per measurement method per study.

All analyses were completed using the Hedges and Olkin approach to meta-analysis and Comprehensive Meta-Analysis software (CMA; Borenstein et al., 2013). A random-effects model was used under the assumption that the underlying population effect size would not be the same for every study. Studies were weighted using the inverse variance method (Borenstein et al., 2009). CMA was used to estimate the effect sizes, their variances, and heterogeneity among studies. Thus, for each analysis we calculated a Q-statistic, I^2, τ, and τ^2 along with each overall effect size estimate. In order to account for observed heterogeneity, we used both subgroup analyses and meta-regression with our hypothesized moderators. Finally, Duval and Tweedie's (2000) trim-and-fill analysis was performed to test for publication bias. Follow-up analyses were conducted to assess whether publication bias detected indicated true bias, or was an artifact of extreme heterogeneity among studies (e.g., Banks et al., 2012; Borenstein, 2017).

Results

Of the 1,870 studies initially screened, 48 primary articles containing 57 individual studies involving a total of 15,498 preschoolers were included in the meta-analyses. The mean age of students in primary studies was 4.31 years, and 54% of students included in the primary studies were male. Of the 48 articles, 33 were on universal interventions and 15 were on targeted interventions. There were a total

of 207 individual effect sizes extracted. The primary studies consisted of one conference paper, one dissertation, one government report, three private reports, and 42 peer-reviewed journal articles. Table 1 provides descriptive information for each included study.

Effects of Universal SEL Programs on Social and Emotional Skill Development and Reduction of Problem Behaviors

A random-effects model was fit to assess the overall impact of SEL programs on preschoolers' development of social and emotional skills. Compared with children in control conditions, children who received a universal SEL intervention showed improvements in overall social and emotional skills ($n = 37$, $g = .34$, 95% confidence interval [CI] = [.27, .41]) and reductions in problem behaviors ($n = 24$, $g = .32$, CI = [.29, .45]) compared with students in control groups. The study-level grand mean was $g = .35$ (CI = [.28, .42]). All effect sizes were significantly different from zero (all ps $< .05$). For the overall study-level mean effect on social and emotional skills and behaviors, the Q-value of 243.43 was also significant ($p < .01$), and I^2, indicating the proportion of true variance, was high (83.57), suggesting that most of the variance in study effect sizes represents true variance, as opposed to variance stemming from sampling error. Taken together, these values indicate substantial heterogeneity among studies and suggest the existence of one or more variables that may moderate the outcomes.

Effects of Targeted SEL Programs on Social and Emotional Skill Development and Reduction of Problem Behaviors

A random-effects model was fit to assess the overall impact of SEL programs on preschoolers' development of social and emotional skills. Compared with children in control conditions, often a wait-control group in most studies, children who received a targeted SEL intervention showed improvements in social and emotional skill development ($n = 13$, $g = .44$, 95% CI = [.35, .53]) and in reduced problem behaviors ($n = 14$, $g = .50$, CI = [.37, .64]), with a study-level grand mean effect of $g = .48$ (CI = [.38, .57]). All effect sizes were significantly different from zero (all ps $< .05$). For the overall study-level mean effect on social and emotional skills and behaviors, the Q-value of 19.46 was not statistically significant ($p > .05$), and I^2, indicating the proportion of true variance, was relatively low (22.91), suggesting that only 22.9% of the heterogeneity stemmed from true variance. Taken together, these values indicate relative homogeneity across studies and very little evidence of heterogeneity.

Moderator Analyses: Universal Interventions

Our next research question was whether outcomes would be moderated by factors identified as such in past research: program type, fidelity of implementation, exposure to program, who delivered the intervention, where the intervention was delivered, participant SES, age, and risk status. The large variability in mean effect sizes reported above suggests that moderating variables exist that could help explain the heterogeneity in the outcome. Both subgroup analyses and meta-regression models were used to determine if any of these variables significantly

TABLE 1

Descriptive information for all included studies

Study name	Report type	*n*	Intervention	Tier	Outcomes	Report types	Delivery setting and agent	Study design	Student characteristics	Fidelity
Azevedo et al., 2013	Journal article	87	The Incredible Years	Targeted	SE skills, behavior	Parent, researcher, teacher	Home; parents	Randomized at child/parent level	Mixed SES	FOI okay
Barnett et al., 2008	Journal article	210	Tools of the Mind	Universal	Behavior	Teacher	School; teachers	Randomized at classroom level	Low SES; ELL; >50% minority	FOI okay
Bierman et al., 2008	Journal article	356	PATHS	Universal	SE skills, behavior	Parent, researcher, student task, teacher	School; teachers	Randomized at school/classroom level	—	FOI concern
Brotman et al., 2005	Journal article	99	The Incredible Years	Targeted	Behavior	Researcher	Home; parents	Randomized at child/parent level	Low SES; >50% minority	FOI okay
Brotman et al., 2008	Journal article	92	The Incredible Years	Targeted	SE skills, behavior	Parent, researcher	Home; parents	Randomized at child/parent level	Low SES; >50% minority	FOI not mentioned
Brown & Sax, 2013	Journal article	205	Kaleidoscope Preschool Arts Enrichment Program	Universal	SE skills	Teacher	School; teachers	QED, no randomization	Low SES; >50% minority	FOI not mentioned
Çelik et al., 2016	Journal article	22	First Step to Success	Targeted	SE skills, behavior	Teacher	School and home; teachers and parents	Randomized at classroom level	Antisocial behaviors	FOI okay
Ciancio et al., 2001	Journal article	71	I Can Problem Solve	Universal	SE skills	Student task	School; teachers	Randomized at classroom level	>50% minority	FOI not mentioned
Conner & Fraser, 2011	Journal article	67	Making Choices, Strong Families	Universal	SE skills, behavior	Researcher, student task	School and home; teachers and parents	Randomized at school/site level	Low SES; >50% minority	FOI okay
Conroy et al., 2015	Journal article	107	BEST in CLASS	Targeted	Behavior	Researcher	School; teachers	Randomized at classroom level	Low SES; >50% minority	FOI okay
Coplan et al., 2010	Journal article	22	Play Skills for Shy Children	Targeted	SE skills, behavior	Researcher, teacher	Community center; researchers	Randomized at child/parent level	Inhibited	FOI okay
Deacon & van Rensburg, 2012	Journal article	48	Unnamed intervention on emotion knowledge, identification, expression	Universal	SE skills, behavior	Other informant report	—	Randomized at child/parent level	—	FOI not mentioned
Domitrovich et al., 2007	Journal article	201	PATHS	Universal	SE skills	Parents, student task, teacher	School; teachers	Randomized at school/site level	Low SES; >50% minority	FOI not mentioned

(continued)

TABLE 1 (continued)

Study name	Report type	*n*	Intervention	Tier	Outcomes	Report types	Delivery setting and agent	Study design	Student characteristics	Fidelity
Farran & Wilson, 2011	Private report	828	Tools of the Mind	Universal	SE skills	Researcher, student task, teacher	School; teachers	Randomized at school/site level	Low SES	FOI okay
Farran et al., 2014	Private report	877	Tools of the Mind	Universal	SE skills	Researcher, student task, teacher	School; teachers	Randomized at school/site level	ELL	FOI concern
Feil et al., 2014	Journal article	124	Preschool First Step to Success	Targeted	SE skills, behavior	Parent, teacher	School and home; teachers and parents	Randomized at child/parent level	Maladaptive behaviors	FOI concern
Feis & Simons, 1985, Y1	Journal article	29	I Can Problem Solve	Universal	SE skills	Student task	School; teachers	Randomized at classroom level	Low SES	FOI not mentioned
Feis & Simons, 1985, Y2	Journal article	30	I Can Problem Solve	Universal	SE skills	Student task	School; teachers	Randomized at classroom level	Low SES	FOI not mentioned
Feis & Simons, 1985, Y3	Journal article	35	I Can Problem Solve	Universal	SE skills	Student task	School; teachers	Randomized at classroom level	Low SES	FOI not mentioned
Finlon et al., 2015	Journal article	248	Emotion Based Prevention Program	Universal	SE skills, behavior	Parent, researcher, student task, teacher	School; teachers	Randomized at school/site level	Low SES	FOI okay
Flook et al., 2015	Journal article	68	Kindness Curriculum	Universal	SE skills	Student task, teacher	School; researchers	Randomized at classroom level	Mixed SES	FOI not mentioned
Hamre et al., 2012	Journal article	596	PATHS	Universal	SE skills	Teacher	School; teachers	Randomized at school/site level	Low SES	FOI okay
Havighurst et al., 2009	Journal article	218	Tuning Into Kids	Universal	Behavior	Parent	Home; parents	Randomized at school/site level	Middle SES	FOI okay
Hemmeter et al., 2016	Journal article	582	Pyramid Model for Promoting Young Children's Social-Emotional Competence	Universal	SE skills, behavior	Researcher, teacher	School; teachers	Randomized at classroom level	Low SES; >50% minority	FOI okay
Howell et al., 2013	Journal article	113	Kid's Club	Targeted	SE skills	Parent	Community center; researchers	Randomized at child/parent level	Low SES	FOI okay
Humphrey & Olivier, 2014	Journal article	199	Teens and Toddlers	Targeted	SE skills	Teacher	School; teenage mentor	QED, no randomization	Mixed SES; ELL; >50% minority	FOI not mentioned

(continued)

TABLE 1 (continued)

Study name	Report type	*n*	Intervention	Tier	Outcomes	Report types	Delivery setting and agent	Study design	Student characteristics	Fidelity
Hurlburt et al., 2013	Journal article	378	The Incredible Years	Targeted	SE skills, behavior	Researcher	Home; parents	Randomized at school/site level	Low SES	FOI not mentioned
Izard et al., 2008, Study 1	Journal article	146	Emotion Based Prevention Program	Universal	SE skills, behavior	Researcher, student task, teacher	School; teachers	Randomized at school/site level	Low SES; >50% minority	FOI okay
Izard et al., 2008, Study 2	Journal article	177	Emotion Based Prevention Program	Universal	SE skills, behavior	Researcher, student task, teacher	School; teachers	Randomized at school/site level	Low SES; >50% minority	FOI okay
Jensen et al., 2013	Journal article	1,045	Action Competences in Social Pedagogical Work	Universal	SE skills, behavior	Teacher	School; teachers	Randomized at school/site level	Mixed SES; at-risk	FOI not mentioned
Lonigan & Philips, 2012	Conference paper	2,564	Tools of the Mind	Universal	SE skills	Teacher	School; teachers	Randomized at classroom level	25% IEP	FOI not mentioned
Lonigan et al., 2015	Journal article	506	PATHS	Universal	SE skills, behavior	Student task, teacher	School; teachers	Randomized at school/site level	Low SES; >50% minority	FOI concern
Loop et al., 2017, G1	Journal article	19	Parental Self-Efficacy Beliefs Intervention (SEBS)	Targeted	SE skills, behavior	Researcher, student task	Home; parents	Randomized at child/parent level	Mixed SES; externalizing behaviors	FOI not mentioned
Loop et al., 2017, G2	Journal article	71	Parental Self-Efficacy Beliefs Intervention (SEBS) + Parental Emotion Coaching Practices (ECP)	Targeted	SE skills, behavior	Researcher, student task	Home; parents	Randomized at child/parent level	Mixed SES; externalizing behaviors	FOI not mentioned
Lynch et al., 2001	Private report	221	Al's Pals	Universal	SE skills, behavior	Teacher	School; teachers	QED, no randomization	—	FOI okay
McGilloway et al., 2012	Journal article	148	The Incredible Years	Targeted	SE skills, behavior	Parents, researcher	Home; parents	Randomized at child/parent level	Low SES; behavior problems	FOI concern
McIntyre, 2008	Journal article	44	The Incredible Years	Targeted	Behavior	Parents, researcher	Home; parents	Randomized at child/parent level	Mixed SES; developmental delays	FOI okay
Morris et al., 2014, IY	Government report	2,763	The Incredible Years	Universal	SE skills, behavior	Student task, teacher	School; teachers	Randomized at school/site level	Low SES	FOI okay
Morris et al., 2014, PATHS	Government report	2,763	PATHS	Universal	SE skills, behavior	Student task, teacher	School; teachers	Randomized at school/site level	Low SES	FOI okay

(continued)

TABLE 1 (continued)

Study name	Report type	*n*	Intervention	Tier	Outcomes	Report types	Delivery setting and agent	Study design	Student characteristics	Fidelity
Morris et al., 2014, TOM	Government report	2,763	Tools of the Mind	Universal	SE skills, behavior	Student task, teacher	School; teachers	Randomized at school/site level	Low SES	FOI concern
Muratori et al., 2017	Journal article	164	Coping Power	Universal	SE skills, behavior	Parent, teacher	School; teachers	Randomized at classroom level	Mixed SES	FOI not mentioned
Ornaghi et al., 2015	Journal article	58	Let's Talk About Emotions	Universal	SE skills	Student task	School; researchers	QED, no randomization	Middle SES	FOI not mentioned
Pickens, 2009	Journal article	296	Peace Works	Universal	SE skills, behavior	Teacher	School and home; teachers and parents	Randomized at school/site level	>50% minority; ELL	FOI okay
Ridley & Vaughn, 1982	Journal article	36	Interpersonal Problem Solving Program	Universal	SE skills	Student task	School; researchers	Randomized at child/parent level	Middle SES	FOI not mentioned
Schmitt et al., 2014	Journal article	30	Positive Action	Universal	SE skills	Teacher	School; teachers	QED, no randomization	—	FOI okay
Seabra-Santos et al., 2016	Journal article	114	The Incredible Years	Targeted	SE skills, behavior	Parent, researcher	Home; parents	Randomized at child/parent level	Middle SES	FOI okay
Shure & Spivak, 1980	Journal article	219	I Can Problem Solve	Universal	SE skills	Student task	School; teachers	Randomized at school/site level	>50% minority	FOI not mentioned
Snyder et al., 2011	Journal article	136	The Incredible Years	Targeted	SE skills, behavior	Researcher	School; teachers	Randomized at school/site level	Low SES; behavior problems	FOI okay
Stefan & Miclea, 2013	Journal article	158	Social-Emotional Prevention Program	Universal	SE skills, behavior	Parent, student task, teacher	School and home; teachers and parents	Randomized at classroom level	Middle SES	FOI okay
Stephenson, 2009	Dissertation	41	Second Step	Universal	Behavior	Teachers	School; researchers	Randomized at child/parent level	Upper SES	FOI not mentioned
Upshur et al., 2013, Y1	Journal article	137	Second Step	Universal	SE skills, behavior	Researcher, teacher	School; teachers	Randomized at school/site level	Mixed SES; >50% minority	FOI okay
Upshur et al., 2013, Y2	Journal article	117	Second Step	Universal	SE skills, behavior	Researcher, teacher	School; teachers	Randomized at school/site level	Mixed SES; >50% minority	FOI okay
Vestal & Jones, 2004	Journal article	64	I Can Problem Solve	Universal	SE skills	Student task	School; teachers	Randomized at child/parent level	Low SES; at-risk	FOI not mentioned
Webster-Stratton et al., 2001	Journal article	272	The Incredible Years	Universal	SE skills, behavior	Parent, researcher, teacher	School and home; teachers and parents	Randomized at classroom level	Low SES; >50% minority	FOI okay
Wilson et al., 2012	Journal article	128	Tuning Into Kids	Universal	SE skills, behavior	Parent, teacher	Home; parents	Randomized at school/site level	Mixed SES	FOI okay

Note. SE = social and emotional; SES = socioeconomic status; FOI = fidelity of implementation; ELL = English language learner; QED = quasi-experimental design; IEP = individuallized education program.

moderated the overall effect of universal SEL programming on student social and emotional skills and the reduction of problem behaviors.

Setting and Delivery to Students

Although the majority of universal interventions were delivered in classroom settings, subgroup analyses showed significant moderating effects of who actually delivered the intervention to students ($Q = 17.63$, $p < .01$). Effect sizes were smallest when teachers delivered the intervention to students ($n = 29$, $g = .28$, $SE = .03$), followed by parents ($n = 2$, $g = .36$, $SE = .09$), and the largest effect size was found for outside researchers delivering the intervention ($n = 4$, $g = .53$, $SE = .14$). Not surprisingly, a strong effect was found when both teachers and parents were trained in the intervention and delivered it to students in their respective environments (both school and home; $n = 4$, $g = .53$, $SE = .12$). A similar pattern emerged for the setting in which the intervention was delivered; significant differences appeared between settings ($Q = 10.52$, $p < .05$). The largest effect sizes were found when the intervention was delivered both at home and during the school day ($n = 4$, $g = .53$, $SE = .12$). Interventions delivered solely at home ($n = 3$, $g = .41$, $SE = .11$) yielded significantly larger effect sizes than programs delivered only during the school day ($n = 34$, $g = .32$, $SE = .04$). Note, however, that only two universal interventions were delivered in the home setting (i.e., all parents within schools were given a training program to implement with students at home, regardless of student risk status). Taken together, these results suggest that parental involvement at home may be a key factor in strengthening the impact of universal SEL interventions.

Student Characteristics

Studies with over 50% of participants reporting low SES levels or free lunch status were categorized as "low SES" studies. Studies with low SES participants ($n = 20$, $g = .26$, $SE = .02$) did not significantly differ from studies with middle- or high-SES participants ($n = 11$, $g = .32$, $SE = .05$). Another binary variable was created for student risk status. Studies containing students identified as demonstrating behavioral issues or coming from turbulent homes were all categorized as "at-risk." However, all participants in this category still received universal, not targeted, interventions, despite having been labeled as having various risk factors. Whereas the participants within the at-risk category were quite diverse, this dichotomy was made due to small samples of each type of risk factor. Studies with at-risk students showed significantly smaller effect sizes ($n = 6$, $g = .21$, $SE = .04$) than studies without at-risk students ($n = 28$, $g = .29$, $SE = .02$; $Q = 2.03$, $p < .05$). Additionally, differences were examined between studies reporting over 50% of students as minority students. Studies with majority-minority students ($n = 21$, $g = .35$, $SE = .03$) did not significantly differ from studies not having more than 50% of minority students ($n = 11$, $g = .29$, $SE = .03$).

Intervention Fidelity, Attrition, and Duration

Analysis of fidelity of implementation was limited by the number of primary studies that failed to mention fidelity in their reports. Of the 41 total universal samples included within the 33 studies, 17 did not include any information about

fidelity of implementation. For the four studies that reported fidelity issues or concerns, effect sizes were lower ($g = .11$, $SE = .04$) than the 20 studies that reported nonproblematic fidelity of implementation ($g = .35$, $SE = .05$). The small sample of studies that reported fidelity issues showed significantly smaller effect sizes ($Q = 23.54$, $p < .05$). However, the 17 primary studies that did not mention fidelity at all showed a larger effect size ($g = .52$, $SE = .01$) than the nonproblematic studies. There is a great deal of ambiguity surrounding the 17 studies that had no mention of fidelity of implementation. Similarly, 24 primary studies did not mention participant attrition ($g = .37$, $SE = .06$). Six studies reported attrition concerns ($g = .22$, $SE = .06$), and 20 studies reported no issues with attrition ($g = .39$, $SE = .07$). Group differences were not statistically significant. There is also ambiguity surrounding the 24 studies that had no mention of attrition.

Study Design

Whereas the present meta-analysis included studies of relatively high quality due to stringent inclusion and exclusion criteria, we nevertheless investigated the potential moderating impact of study design quality on SEL outcomes. We computed the effect of all RCTs, with randomization occurring at any level ($n = 37$, $g = .34$, $SE = .04$), compared with true quasi-experimental designs, which did not involve random assignment of conditions to children, classrooms, or schools ($n = 4$, $g = .50$, $SE = .11$). This smaller effect size associated with higher quality study designs was in the direction we anticipated, and the difference was statistically significant ($Q = 7.96$, $p < .05$). This finding, however, must be treated with caution given our very small sample size for quasi-experimental designs.

Measurement Type

Last, we tested whether there were any differences stemming from the types of assessments used to measure social and emotional skills. Significant differences in effect sizes were found ($Q = 51.18$, $p < .05$), with child task measures ($n = 22$, $g = .38$, $SE = .06$) showing the largest effect sizes, followed by observer report ($n = 10$, $g = .37$, $SE = .09$), followed by parent-report measures ($n = 8$, $g = .32$, $SE = .06$) and teacher-report measures ($n = 30$, $g = .24$, $SE = .03$).

Meta-Regression Analyses

Due to the large amount of heterogeneity in our main analysis, we tested a series of meta-regression models with various moderators as predictors. We hypothesized that intervention type may have explained some of the heterogeneity among studies, as various components such as duration of treatment, delivery setting and method, and theoretical foundation were likely to have been nested within the intervention program itself. The best fitting model, which accounted for the most variance in heterogeneity ($R^2 = .83$) included intervention type as a covariate ($Q = 90.45$, $p < .05$). The intervention type variable was dummy coded as follows: studies with various interventions of sufficient n count were entered into the model as a series of dummy variables, with the remaining studies reporting on various other interventions were averaged and entered as the baseline of the model. The outcome variable was the overall grand mean, which combined

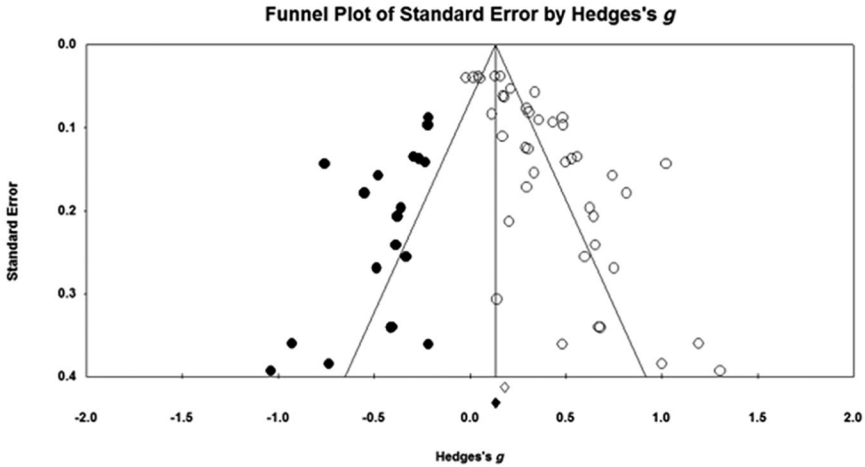

FIGURE 2. *Funnel plot with imputed studies from Duval and Tweedie's (2000) trim-and-fill analysis.*

the development of social and emotional skills and the reduction of problem behaviors.

Based on this analysis, intervention program type accounts for most of the heterogeneity in the overall mean effect. To our surprise, no other potential moderators, such as duration of intervention, fidelity of implementation, total hours of exposure to intervention, delivery setting, participant risk status, age, or study design improved the R^2 of the model when added as predictors. However, as discussed below, many of these factors were likely nested within the intervention program study design and delivery protocols.

Publication Bias

Our final analysis explored potential publication bias among studies included in the meta-analysis. For the overall mean effect, Duval and Tweedie's (2000) trim-and-fill method indicated likely concern for publication bias. There was an absence of studies in the lower left-hand corner of the funnel plot, and 18 studies were consequently imputed in the trim-and-fill analysis. The confidence interval for the true effect included zero after imputation, suggesting strong evidence for publication bias. Figure 2 depicts the funnel plot with the imputed studies.

Caution is warranted, however, as publication bias is frequently confounded with heterogeneity, especially in cases of extreme heterogeneity (Borenstein, 2017). In cases such as the present one, it is unclear if asymmetry is a result of true heterogeneity between studies, or true publication bias. In order to investigate this question further, we examined meta-analytic results of intervention programs individually, rather than in a combined analysis. We conducted these analyses on the three interventions with the largest samples of primary studies: Tools of the Mind, PATHS, and I Can Problem Solve. Table 2 shows the heterogeneity statistics and

TABLE 2

Heterogeneity for intervention programs analyzed separately

	I Can Problem Solve	PATHS	Tools of the Mind
Point estimate (*SE*)	.91 (.10)	.19 (.03)	.05 (.03)
Q value, *df*	5.42 (6)	3.72 (4)	13.15 (4)
p value	.05	.45	.02
I^2	0	0	61.98
τ	0	0	0.06
Imputed studies	0	0	0

publication bias results for each intervention program when analyzed separately. As predicted, there was much less heterogeneity in each of the analyses when conducted by intervention than there was in the combined analysis. Though publication bias may still be confounded with small sample size, it is likely that the evidence suggesting publication bias in the combined analysis is confounded with extreme heterogeneity between studies.

Moderator Analyses: Targeted Interventions

Although targeted interventions did not show any evidence of heterogeneity, several moderator analyses were completed when sample size permitted (each subgroup >3 studies) in order to identity potential moderators in the implementation of targeted interventions.

Setting and Delivery to Students

The majority of targeted interventions were delivered in home settings, with parent training models being utilized to train the parents, and then parents implementing practicing new skills and practices at home with their children ($n = 11$). There were not enough studies implemented in school settings to conduct moderator analyses on setting or delivery factors.

Student Characteristics

Studies with over 50% of participants reporting low SES levels or free lunch status were categorized as "low-SES" studies. Studies with low SES participants ($n = 5$, $g = .48$, $SE = .08$) did not differ significantly from studies with middle- or high-SES participants ($n = 5$, $g = .46$, $SE = .08$). Additionally, differences were examined between studies reporting over 50% of students as minority students. Studies with majority-minority students showed larger effect sizes ($n = 3$, $g = .53$, $SE = .11$) than studies not having greater than 50% of minority students ($n = 4$, $g = .36$, $SE = .09$), and this difference was statistically significant ($Q = 9.54$, $p < .05$).

Intervention Fidelity, Attrition, and Duration

There were not enough studies reporting information on fidelity implementation to consider fidelity as a moderator. For attrition, four studies made no

mention of attrition ($g = .41$, $SE = .06$), three studies reported attrition concerns ($g = .51$, $SE = .12$), and nine studies reported no issues with attrition ($g = .53$, $SE = .07$). Group differences were not statistically significant.

Study Design and Measurement Type

There were not enough studies employing quasi-experimental methods to conduct moderator analyses based on study design. Only observation and teacher- and parent-report were used in these studies. Effect size estimates did not significantly differ between observer reports ($n = 12$, $g = .54$, $SE = .08$), parent reports ($n = 7$, $g = .47$, $SE = .07$), or teacher reports ($n = 5$, $g = .43$, $SE = .11$).

Intervention Type

The intervention implemented most frequently in targeted intervention studies was *The Incredible Years* parent training program intended for parents of preschool-aged children. Although no other intervention programs were used with high enough frequency to make comparisons, the point estimate for students receiving *The Incredible Years* was $g = .47$ ($SE = .08$).

Discussion

Whereas effects of SEL interventions among K–12 children have been widely studied using meta-analytic methods, there has been no corresponding meta-analyses of SEL interventions for preschool-age children to date. Thus, this meta-analysis reviewed the effects of SEL interventions on the development of social and emotional skills and the reduction of problem behaviors in high-quality studies involving 15,498 preschoolers in both universal and targeted settings.

Universal Interventions

In universal settings, the overall effect size of $g = .35$ suggests that SEL interventions positively affect the development of social and emotional skills and the reduction of problem behaviors in preschoolers. According to Cohen's (1992) benchmarks, this would typically be described as a small to medium effect size. However, using absolute benchmarks independent of contextualization within a field is not recommended. Another method of interpreting effect sizes is to compare the effect size to similar literature within the discipline (Schafer & Schwarz, 2019). As a point of comparison, the overall effect size in Durlak et al.'s (2011) meta-analysis of school-based, universal SEL programs among K–12 students was similar ($d = .30$; CI = [.26, .33]). This suggests that SEL interventions with preschoolers are approximately as effective as those targeted at K–12 children. Additionally, Hattie et al. (1996) found that the benchmark for effective interventions in educational contexts is typically $d = .40$. Therefore, an overall mean effect of $g = .35$ can be interpreted as meaningful within the context of educational interventions. However, we know that effect size estimates within a discipline may be inflated due to publication bias, a concern that is discussed further in the following section (see Schafer & Schwarz, 2019). There was also substantial heterogeneity among universal effect size estimates, with the SEL intervention program accounting for the vast majority of this variability. Effect sizes varied

greatly among SEL intervention programs, a finding that is discussed in more detail below.

Moderators

Many of our predicted moderators did not significantly moderate differences in outcomes or improve meta-regression models beyond the large amount of variance accounted for by intervention program type. It appears that many of our selected moderators corresponded directly to the particular intervention program, such as delivery setting and who delivered the intervention. This collinearity of moderators resulted from the fact that several of the moderators are nested within particular intervention programs, which likely left intervention program as the primary moderator of outcomes.

In terms of participant risk status, studies with high percentages of low SES and minority students had gains approximately equal to studies without majority low-SES or minority student samples. This is in line with Taylor et al.'s (2017) findings of approximately equal gains for minority and nonminority and high- and low-income students in kindergarten through 12th-grade students, showing that universal SEL interventions can benefit all students, regardless of SES or race. Studies with students who were identified as at-risk, however, showed smaller effect sizes, suggesting that students exhibiting any type of risk factor did not benefit as much from universal SEL intervention programming.

Many of the moderator categories, such as attrition and fidelity of implementation, had small sample sizes due to incomplete primary study reporting. Similar to Durlak et al.'s (2011) findings, only 58% of primary studies explicitly discussed fidelity of implementation. In the future, intervention studies should always measure and report fidelity of implementation, considering how critical it is for programs to operate successfully (Domitrovich et al., 2010; Durlak & DuPre, 2008). However, studies that reported fidelity of implementation issues did show smaller effect sizes, which confirms the importance of fidelity of implementation as a factor to consider in obtaining the largest gains from intervention implementation. The analysis of study design was also limited by the small number of included studies that used true quasi-experimental designs ($n = 4$). Most designs used randomization at some level, whether it be the student, classroom, or school. However, studies that used quasi-experimental designs did show significantly larger effect sizes, replicating the effect that Corcoran et al. (2018) found in a meta-analysis of universal P–12 interventions on academic achievement.

Results by SEL Intervention

Meta-regression analyses revealed that the largest proportion of heterogeneity was accounted for by the intervention program children received. Not surprisingly, the point estimates for the overall grand mean varied greatly by intervention type, ranging from the largest effect for I Can Problem Solve ($n = 7$, $g = .91$, $SE = .09$) to the smallest effect for Tools of the Mind ($n = 5$, $g = .05$, $SE = .04$). SEL interventions are grounded in various theoretical frameworks, and this range of theoretical foundations, in addition to which skills programs target, may

contribute to variable program effects, as suggested by this meta-analysis. For example, Tools of the Mind, which showed the smallest effect size, heavily targeted self-regulation as an outcome. In contrast, programs showing larger effects, such as I Can Problem Solve, generally targeted social and communication skills. One possible explanation could be attributed to developmental implications of the target skills. It is plausible that some social and emotional skills are more receptive to intervention than others during the preschool years. For example, young children may not have fully developed the capacity for metacognitive thinking, which is a component of self-regulation, but is a skill that does not develop until about age four (Dimmitt & McCormick, 2012). Social and communication skills, however, fall into the category of relationship skills that may be most developmentally relevant for interventions in the preschool years (see Denham, 2015). Moreover, according to Vygotskian theory (Vygotsky, 1934/1986), young children first develop new capacities on an interpersonal social plane, before internalizing these skills for self-regulation and self-direction. Thus, improvements in social and communication skills may precede gains in self-regulation. Though speculative, this illustrates the importance of a strong theoretical basis as well as developmental appropriateness of SEL curricula to maximize student gains.

In addition to theoretical factors, different studies implementing different interventions utilized various design and analysis approaches, which often varied systematically by intervention. For example, the Tools of the Mind intervention was most often implemented within multi-site cluster randomized designs, made use of multi-informant reports, and, in some cases, reported fidelity issues (e.g., Morris et al., 2014). On the other hand, several of the I Can Problem Solve interventions made use of less rigorous designs, with effect sizes remaining uncorrected for cluster randomization and relying on single-informant measures, often made by the delivery agent of the intervention (i.e., a teacher delivering the intervention completed the teacher rating scale used as an outcome measure). In summary, there are likely a multitude of other factors confounded with the intervention type itself that could explain the intervention type emerging as the best-fitting meta-regression model and accounting for the most variance across effects. Unpacking these factors nested within the intervention type variable is a rich avenue for further research.

Targeted Interventions

In targeted intervention settings, where only students identified as being at-risk received intervention services, the overall effect size of $g = .48$ suggested that SEL interventions positively affected the development of social and emotional skills and the reduction of problem behaviors in preschoolers. The largest effect in this study was seen in at-risk students who received interventions resulting in reductions of problematic behaviors ($g = .50$). Both of these effect sizes were larger than the effect sizes for universal interventions, potentially suggesting that students identified at-risk had more to gain from early intervention than their non-at-risk peers. Additionally, there was very little heterogeneity across these studies. This pattern can likely be attributed to the fact that many of these studies

implemented the same intervention, and the intervention setting was consistent across most studies, but nonetheless, the lack of heterogeneity showed a relatively stable effect for targeted interventions.

Many theoretically meaningful moderator analyses were unable to be completed due to the smaller sample of targeted versus universal interventions. However, one finding of note was that minority students receiving targeted interventions showed a larger effect than nonminority students receiving similar interventions. This suggested that minority students, in particular, could benefit from additional supports, and particularly those that were delivered via parent trainings and in the home environment. Also of note is the juxtaposition of the effect for at-risk students receiving universal interventions ($g = .21$) and the effect for at-risk students receiving targeted interventions ($g = .48$). Though not directly comparable, this finding suggested that students who were at-risk could benefit more from targeted interventions rather than universal interventions designed to support all students.

Generalizability of Conclusions

Generalizability statements should be made with caution based on the results of this meta-analysis, particularly by program. Though it indeed appears that not all SEL programs are equally effective for preschoolers, we cannot make causal claims due to the observational nature of moderator analyses (i.e., studies were not randomly assigned to intervention condition, they were observed qualities of the data). Because of the observational nature of these analyses, no causal statements can be made comparing one program to another.

Generalizability to K–12 education based on results from preschoolers should also be made with extreme caution. In Durlak et al.'s (2011) meta-analysis of universal K–12 programs, interventions that were delivered in school settings by school personnel showed the largest effect sizes. However, in this meta-analysis, universal programs that were delivered by preschool classroom teachers showed the smallest effect sizes when considering different delivery settings. Larger effect sizes were found in universal interventions that combined parent-delivered interventions in the home with teacher-delivered interventions at school. Stacking intervention contexts appeared to be associated with increased gains for students in this study, and echoes claims made from economic data for the cost-effectiveness of stacking intervention programs (Foster et al., 2007). Given the uniqueness of the preschool years, in which students spend less time in school and more time at home compared with their school-aged counterparts, it is logical that interventions combining both parent and teacher intervention components have been successful in helping preschoolers develop social and emotional skills (e.g., Foster et al., 2007; Landry et al., 2017; Sandy & Boardman, 2000; Webster-Stratton & Herman, 2010). This notion is also theoretically supported by ecological systems theory, as both the home and school interact within the preschooler's most immediate mesosystem (Bronfenbrenner, 1986). The results of the present study suggest that establishing continuity of SEL intervention components across both systems may increase its benefits for the child, particularly for preschoolers. In general, findings from one age group of students should not be generalized to students of different age groups, particularly in a preschool context, in which

developmental implications are different from those of school-aged children. Additionally, findings from the targeted interventions in this study cannot be generalized to programs implemented in universal settings.

Methodological Limitations and Future Research

This meta-analysis is not without limitations. First, there was a small number of studies in several of the subgroup analyses, particularly in the targeted intervention analyses, such as study design, intervention type, and fidelity of implementation. As a result, these effect size estimates may be less precise due to the lack of power, and should be interpreted cautiously.

Second, there was a limited amount of gray literature included in the final meta-analysis. Although some gray literature was uncovered during our search process (e.g., dissertations, conference papers, private reports), many of the studies were excluded due to nonrigorous study designs. This may have resulted in a tradeoff: losing much of the gray literature increased the threat of publication bias, though benefits in accuracy of assessment were likely gained by including only studies with high-quality design. A future study could repeat this analysis using any type of quasi-experimental pre/post control group design primary study, as opposed to only those with established baseline equivalence or statistical controls.

Additionally, there are effect sizes reported in this meta-analysis that remain uncorrected for cluster-randomized designs, in which results are reported at the student level, rather than the unit of randomization (in many cases, either the district, school, or classroom). As a result, the variances of the effect sizes are likely underestimated. In addition, the standard errors are also biased, which then influence *Q*-statistics computed in all moderator analyses. Therefore, it is likely that in addition to effect size estimates being biased, we also may have had an increased Type I error rate for all subgroup analyses completed with uncorrected effect sizes. Of all included studies that remained uncorrected (i.e., effect sizes reported were not from hierarchical linear modeling analysis approaches), only two reported any ICC information, but these were reported as a range across all outcomes rather than as individual ICCs per outcome. Therefore, the decision was made not to use an ICC within the range to generate the effect size correction factor, as an accurate ICC estimate is pivotal to calculating the effect size and variance correction precisely (Hedges, 2007). Whereas benchmark ICCs exist for other academic subjects such as math and science (Hedges & Hedberg, 2007), benchmarks for the SEL domain do not currently exist. Authors of primary evaluation studies should ideally report ICCs in their articles so that future meta-analyses in the SEL field can correct the effect size estimates for cluster-randomized designs. This correction for cluster randomization remains uncommon, with only three of 60 reviewed meta-analyses employing this correction (Hedges, 2007).

In addition to being uncorrected for cluster randomized, it is likely that there is also publication bias present in this analysis, and as a result the effect sizes computed are likely overestimated. Trim-and-fill analysis of all universal interventions combined showed evidence of publication bias, and while this can be partially attributed to extreme heterogeneity, is still likely indicative that publication bias does exist. Schafer and Schwarz (2019) recently reported that effects are

likely overestimated across subdisciplines as a result of publication bias. In their study, they found that effects from preregistered studies (median $r = .16$) were much smaller than effects from studies without preregistration (median $r = .36$). This suggests that subfields in general likely have biased average effects, and this phenomenon is an inherent limitation to all meta-analyses.

Also regarding the effect sizes in the meta-analysis, multiple methods were used to collect data in each of the primary studies (i.e., student tasks, parent-report, teacher-report, and observer reports). Several measures reported unacceptable reliability estimates, with estimates as low as $\alpha = .47$ for several parent rating scales. In addition to concerns about reliability, there is also often limited agreement between report types. Reports coming from the same informants intended to measure the same skills often vary from one another (De Los Reyes et al., 2015), which adds a source of variance that makes it difficult to determine the true score for each social and emotional skill measured in this analysis.

Last, this meta-analysis only considered the development of social and emotional skills and the reduction of problem behaviors as outcomes of interest. Besides the theoretical focus on preschool SEL outcomes in this review, another reason for this was that these were the predominant outcomes included at the preschool level. Academic achievement was only included as an outcome in a handful of reviewed studies, and therefore there was not enough information on achievement to have included it in the analysis as an outcome of interest. We know that SEL programs are intended to bolster a slew of other meaningful outcomes for students, including improved school attendance, increased academic achievement, and increased positive attitudes toward school (e.g., Brackett & Rivers, 2014; Jones et al., 2010; Zins et al., 2004). Future studies could expand on the SEL outcomes collected in this study by including such additional outcome measures of interest, and for preschoolers in particular, measures of school readiness. Future studies could also consider longitudinal outcomes across multiple time points in order to determine the lasting impact SEL interventions have.

Implications for Policy and Practice

Findings from this meta-analysis can first inform researchers evaluating SEL interventions. Variables such as fidelity of implementation and attrition are critical factors in considering the effectiveness of SEL programs, yet only roughly half of the primary studies included in this review reported any information on them. Considering these variables in intervention studies is critical, and should be prioritized by researchers in this field. Additionally, this study calls into focus the relevance of reporting effects that take into account the unit of randomization; primary studies that employ cluster-randomized designs should aim to either report effect sizes that are corrected for the nested data structure (i.e., through the use of hierarchical linear modeling) or report ICCs in addition to effects at the individual level.

Overall, the findings of this meta-analysis suggest that preschoolers benefit from receiving SEL interventions. Exposure to both universal and targeted SEL interventions resulted in gains in the development of social and emotional skills and the reduction of problem behaviors. Early intervention, both targeted and universal, is worth investing in, particularly during the preschool years, where

children have perhaps the greatest potential in terms of development. However, not all intervention programs showed the same effect sizes. Furthermore, effects were larger for at-risk students receiving targeted interventions than for at-risk students receiving universal interventions. In summary, we recommend that those wishing to implement SEL programs use high-quality, rigorously evaluated, setting and age-specific evidence in selecting a developmentally appropriate SEL program that will benefit their students. We support McClelland et al.'s (2017) notion that many factors influence intervention effectiveness, and "a one-size-fits-all approach to intervention may not help all children" (p. 39). Therefore, policymakers and educators should consider the unique needs of the preschool population carefully before investing in a SEL program for their students, in addition to the specific needs of the particular preschoolers they wish to serve. The early years of development are too critical for practitioners not to select curricula that will confer the greatest benefits to the children involved.

Note

We wish to acknowledge and thank Hannah R. Rothstein, David Rindskopf, and Kate E. Walton for guidance and feedback on earlier versions of this article.

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Authors

DANA MURANO is a research scientist at ACT, Inc. in the Center for Social, Emotional, and Academic Learning, 500 ACT Drive, Iowa City, IA 52243-0168, USA; email: *dana.murano@act.org*. She completed her PhD in educational psychology at The Graduate Center, City University of New York. Her specialization is in learning, development, and instruction. Her research focuses on the assessment and development of social and emotional skills in educational contexts.

JEREMY E. SAWYER is an assistant professor of psychology at Kingsborough Community College, City University of New York, 2001 Oriental Boulevard, Brooklyn, NY 11235-2398, USA; email: *jeremy.ek.sawyer@gmail.com*. He has a PhD in developmental psychology and is a certified bilingual school psychologist. He studies development in educational contexts, including the benefits of play for children's motivation, cognition, and language development.

ANASTASIYA A. LIPNEVICH is an associate professor of educational psychology at Queens College, City University of New York, 65-30 Kissena Blvd, Flushing, NY 11367, USA; email: *anastasiya.lipnevich@qc.cuny.edu*. Her research interests include instructional feedback, attitudes toward mathematics, emotions and affect, alternative ways of cognitive and noncognitive assessment, and the role of noncognitive characteristics in individuals' academic and life achievement.