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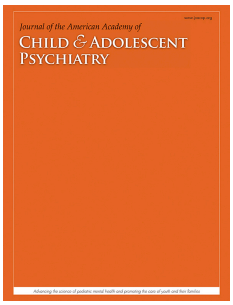

The Effectiveness of School-Based Mental Health Services for Elementary-Aged Children: A Meta-Analysis

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RH = School-Based Mental Health Services

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ABSTRACT

Objective: Given problems and disparities in the utilization of community-based mental health services for youth, school personnel have assumed frontline mental health service roles. To date, the majority of research on school-based services has evaluated analogue educational contexts with services implemented by highly trained study staff, and little is known about the effectiveness of school-based mental health services when implemented by school professionals.

Method: We used random-effects meta-analytic procedures to synthesize effects of school-based mental health services for elementary-aged children based exclusively on studies without direct implementation by researchers, and potential moderators of treatment response. Forty-three controlled trials evaluating 49,941 elementary school-aged children met selection criteria (mean grade=2.86, 60.3% male).

Results: Overall school-based services demonstrated a small-to-medium effect (Hedges' g=0.39) in reducing mental health problems, with the largest effects found for targeted intervention (Hedges' g=0.76), followed by selective prevention (Hedges' g=0.67), relative to universal prevention (Hedges' g=0.29). Mental health services integrated into students' academic instruction (Hedges' g=0.59), those targeting externalizing problems (Hedges' g=0.50), those incorporating contingency management (Hedges' g=0.57), and those implemented multiple times per week (Hedges' g=0. 0.50) showed particularly strong effects.

Conclusion: Considering serious barriers precluding youth from accessing necessary mental health care, the present meta-analysis suggests child psychiatrists and other mental health professionals are wise to recognize the important role that school personnel, who are naturally in children's lives, can play in reducing child mental health problems.

Key words: school-based mental health care, meta-analysis, universal prevention, selective prevention, targeted intervention

INTRODUCTION

By adolescence, approximately 30-40% of youth in the US will have been diagnosed with at least one mental disorder.[1-3] The majority of these disorders onset early in life, with the median ages of onset for anxiety, behavior, and mood disorders occurring prior to age 14.[4] Left untreated, mental disorders first appearing during the elementary school years tend to persist[2] and are associated with considerable problems in adolescence and adulthood, including impaired social functioning, suicidality, substance misuse, criminality, reduced educational and occupational attainment, and quality of life.[5-10] Accordingly, effective prevention and early intervention during the elementary school years are critical. Despite progress in the development and evaluation of efficacious treatments for child mental health problems,[11,12] less than half of affected youth receive mental health care.[13,14] The situation is particularly concerning for racial and ethnic minority children who receive fewer and poorer quality mental health services relative to their non-Latino White peers.[15-18]

Given problems and disparities in the accessibility and utilization of clinic-based child mental health treatment, educators and school staff have assumed frontline mental health provider roles for affected children, with over half of youth who seek services receiving them in school-based settings.[13,19-21] School-based mental health services may reduce persistent disparities in mental health need or service utilization, as they are more accessible than community-based services and are perceived as more acceptable by families.[15,20,22] Indeed, youth referred to school-based services are more likely than youth referred to community-based services to successfully engage in and attend at least three or more sessions.[23] Educational policies have further prioritized the integration of children's mental health services in school settings. Provisions under the Individuals with Disabilities Education Act (IDEA) require schools

to provide necessary services to children with disabilities to ensure equal educational access; Response to Intervention (RtI) proposes a multi-tiered approach to early identification and support of students' mental health needs, with Universal Prevention, Selective Prevention, and Targeted Intervention services progressively implemented upon children's failure to adequately respond to previous tiers of support.[24]

Although a sizable body of literature has evaluated school-based treatments for elementary-aged children, [25-28] much remains to be learned about the effectiveness of school-based mental health programs, which in turn can meaningfully inform partnerships and referral practices among child psychiatrists and other mental health professionals. Specifically, although teachers and school counselors provide the vast majority of school-based mental health services, the majority of research on school-based treatments has evaluated analogue educational contexts with experimental services implemented by highly trained study staff rather than by school professionals under natural school conditions.[26,27] A limited understanding of the effectiveness of school-based mental health services when implemented by school professionals may contribute to the limited application of evidence-based mental health practices in schools.[26] Prior reviews of school-based mental health programs that include studies of services implemented by outside providers (e.g., researchers, graduate students) have generally supported the efficacy of school-based services, but speak little to generalizability, feasibility, and sustainability.[27-29]

The present meta-analysis offers the first quantitative synthesis of the effectiveness of school-based mental health programs for elementary-aged children based exclusively on studies that do not directly involve researchers in service provision. We employed random-effects meta-analytic procedures to evaluate the overall effect of mental health services delivered by school personnel on youth mental health problems overall and for different outcomes, separately. To

identify for whom and under what conditions school-based mental health programs yield differential effects, we further evaluated the potential moderating roles of service level (i.e., universal prevention, selective prevention, or targeted intervention), service intensity, service duration, service components, and child demographic factors (e.g. socioeconomic status [SES], minority status, age).

METHOD

Study Selection Criteria

Studies that satisfied six criteria were included: (1) study assessed school-based services specifically targeting mental health problems; (2) service was implemented by school-based personnel or personnel indigenous to the school environment (research staff could be involved, but could not be the primary service implementer); (3) study entailed a randomized, between-subjects, controlled comparison or quasi-experimental design that used matched samples to minimize selection bias; (4) study assessed acute mental health outcomes (i.e., externalizing problems such as aggression, oppositionality, or hyperactivity; internalizing problems such as anxiety, depression, or stress; attention problems; and/or substance use problems); (5) participants were elementary-aged (i.e., K through 5^{th} grade; if participants spanned multiple grades, the mean grade of participants had to be $<6^{th}$); and (6) study published before January 1, 2015. For quality control, studies that had not undergone peer review were excluded.

Several strategies identified eligible studies. First, computerized searches were conducted in PubMed and PsycINFO using keywords for school, student/child, mental health problems, services and clinical trial (for full list of search terms, see Table S1, available online). Second, a backward reference search examined reference sections of articles identified via the electronic

database search for unidentified articles. Finally, focused searches of work from known experts in school mental health were conducted. Figure 1 presents the flow of studies included.

Variable Coding

Eligible studies were reviewed and coded for sample, service, and design characteristics. For each study, mean grade, % male participants, % racial/ethnic minority children, and % students from low SES backgrounds (as defined by each study; e.g., % students receiving free/reduced lunch) were recorded. Effect size data were extracted for externalizing problems (i.e., aggression, oppositionality, hyperactivity symptoms), internalizing problems (i.e., anxiety, stress, depression symptoms), attention problems, and substance use problems. For each study, effect sizes were only extracted for mental health outcomes specifically targeted by the service being evaluated (e.g., if an intervention directly targeted anxiety, but outcome analyses also examined secondary impacts on substance use, only anxiety outcomes from that study were included). Some interventions were designed to target multiple child problems, and therefore yielded multiple outcomes presently analyzed.

Service Characteristics.

Service Level of each mental health program was coded as either (1) universal prevention (i.e., provided to all students in a classroom); (2) selective prevention (i.e., provided only to students at risk for mental health problems per teacher referral or a mental health screening); or (3) targeted intervention (i.e. provided only to students identified as having mental health problems). Two studies evaluated both universal and selective prevention programs in single articles. In these cases, the individual studies within articles were treated as two separate studies.

Direct service implementers were coded as teachers, paraprofessionals, counselors/school psychologists, and/or parent volunteers.

Service duration was categorized as 1-12 weeks, 13 weeks-1 academic year, or >1 academic year.

Service intensity was coded as daily, multiple times/week, or weekly or less. If a mental health program had multiple components with different intensities (e.g., a weekly lesson and daily activities), service intensity was coded by the highest frequency component.

Service strategies were coded for key mental health strategies implemented—i.e., skill development (social skills, problem-solving, coping skills) and contingency management. Contingency management refers to the provision of positive consequences or rewards for positive behavior and the implementation of negative consequences, or removal of privileges for negative behaviors. Codes were categorized based on study authors' descriptions of the services. Each service may have contained multiple strategies.

We also coded whether mental health interventions were integrated into the students' existing academic instruction, or whether they entailed mental health curriculum or services added to core academic material. For example, the Good Behavior Game was coded as integrated, as it rewards children for appropriate on-task behavior while they engage in their normal academic curriculum. In contrast, pull out mental health treatments or structured social emotional learning (SEL) curriculum programs that were implemented in addition to normal academic instruction were coded as not integrated. Moreover, studies were coded for use of intention-to-treat (ITT) analyses (i.e., included all research participants in posttreatment analyses, regardless of missing data) or not (i.e., removed cases from posttreatment analyses due to missing data).

Procedure

Three study authors served as study coders. Didactic training, practice coding, and 20% double-coding of study articles ensured coding reliability. During training and practice coding, coders met with the first author to discuss discrepancies. Interrater reliability was high (.86) on the 20% of articles that were double-coded.

Data Analysis

Random-effects (RE) meta-analytic models were used, as they assume population parameter values vary between studies. RE analysis is recommended over fixed-effect methods that assume homogeneous effects, given that RE models more accurately reflect real world heterogeneity of effects, even in the absence of known moderators.[30] Effect sizes of standardized mean differences were estimated using Hedges' g and its 95% CI. Hedges' g is similar to Cohen's d but corrects for bias related to sample size.[31] Only one effect size per construct/per study was submitted to meta-analysis. Within each study, multiple effect sizes for the same construct (e.g., two different measures of aggression) were averaged prior to quantitative synthesis with effects from other studies. The magnitude of Hedges' g is interpreted as small (g=0.3), medium (g=0.5), and large (g=0.8). We further calculated Z-scores to express pooled effect sizes in terms of standardized scores, and to evaluate the significance of pooled effects. Homogeneity of effect sizes was determined using Q statistics, which test whether variability across effects differs from chance expectation.[31] Heterogeneity across effect sizes was expected, given the diversity of methodologies, outcomes, students, and services evaluated across studies. Potential categorical moderators were assessed via $Q_{Between}$ tests, which evaluate systematic variability across different levels of categorical variables. Potential continuous moderators were assessed via meta-regression and respective Q tests. Given limitations of traditional methods to accurately assess publication bias (e.g., fail-safe N), we assessed publication bias via sensitivity

analysis methods as recommended by Vevea and Woods,[32] which generate adjusted population pooled effect sizes for hypothetical scenarios of moderate and severe one- and two-tailed selection biases. Sensitivity analyses were conducted in R. All other analyses were conducted in comprehensive meta-analysis.

RESULTS

Preliminary Findings

A total of 43 studies evaluating 49,941 children met inclusion criteria[33-73] (see Table 1 and Supplement 1 for characteristics and references of studies included in the meta-analysis, available online). All studies involved classroom implementation except for 2 (5%). Interestingly, only a minority of studies (25.6%; k=11) evaluated academic outcomes, despite service implementation occurring in the school setting. All studies were randomized trials; 37% of studies conducted ITT analyses. Full details on children and services evaluated in articles included in the meta-analysis are presented in Table 2.

Effectiveness of School-Based Mental Health Services

Table 3 presents results of analyses examining effects of school-based mental health services across all mental health problems and broken down by domain, and Figure 2 presents a forest plot of overall study effects. Across all outcomes, there was a small-to-medium effect of school-based services on mental health problems, although there was significant variability across studies. One systematic source of variability was domain of mental health problem targeted, with the largest effects associated with externalizing problems (medium effect), followed by internalizing problems (small effect), and attention problems (small effect) (see Table 3, and Figure S2 for forest plot, available online). School-based services did not have a significant acute effect on elementary-aged children's substance use.

Moderators of School-Based Mental Health Service Effectiveness

Tables 3 and 4 present results of moderation analyses probing the significant heterogeneity observed across outcomes. Differences associated with service implementer (i.e., teachers versus counselors) could not be assessed do to the limited variability. The magnitude of effects varied significantly by service level, such that targeted intervention and selective prevention showed large and high-medium effects, respectively, whereas universal prevention demonstrated small, but significant, effects (see Figure S3a for forest plot, available online). Specifically, among school-based services targeting externalizing problems, service level again predicted heterogeneity of effects ($Q_{Between}$[df=2] =10.64, p=.005), with targeted intervention demonstrating large effects (Hedges' g=0.80) and universal prevention demonstrating small-to-medium effects (Hedges' g=0.39). Too few studies (k=3) assessed selective prevention for externalizing problems to enable meta-analysis. Looking specifically among programs targeting internalizing problems, universal prevention demonstrated a small but significant effect (Hedges' g=0.16, p<.05). Too few studies assessed selective prevention (k=4) and targeted intervention (k=1) for internalizing problems to enable meta-analysis.

Variability in service intensity also accounted for significant heterogeneity in school-based service effectiveness. Specifically, school-based services that were conducted daily or multiple times/week demonstrated medium effects, whereas school-based services conducted weekly or less demonstrated only small effects (see Table 4 and Figure S3b for forest plot, available online). Among services specifically targeting externalizing problems, those conducted daily or multiple times/week demonstrated medium effects (Hedges' g=0.61, and Hedges' g=0.59, respectively), whereas services conducted weekly or less did not show a significant effect (Hedges' g=0.11, p=.18). Among school-based services specifically targeting internalizing

problems, services conducted weekly or less also demonstrated small effects (Hedges' g=0.29). Too few studies evaluated school-based services targeting internalizing problems that were conducted daily (k=4) or multiple times/week (k=2) to enable meta-analysis.

Integration of mental health services into the normal academic curriculum significantly improved the effectiveness of school-based services (see Table 4 and Figure S3c for forest plot, available online). Such integrated mental health services demonstrated medium effects, whereas services that were curriculum-driven and not integrated into existing academic material showed small effects.

Level of service duration did not significantly predict variability in the effectiveness of school-based mental health services (see Table 4). Analyses considering service duration as a continuous predictor similarly yielded non-significant results. Variability in child grade and the distribution of participating youth from lower SES and racial/ethnic minority backgrounds also did not influence the effectiveness of school-based mental health services (see Table 4).

Among specific school-based mental health strategies assessed (i.e., psychoeducation, emotion regulation, problem-solving, and contingency management), only contingency management accounted for significant variance in child mental health outcomes (see Table 5 and Figures 4a, b for forest plots, available online). Across psychopathology domains, services that included contingency management showed medium effects, whereas those that did not include contingency management showed small effects (see Table 5). These results were particularly pronounced among services targeting externalizing problems, with externalizing services containing contingency management showing a medium-to-large effect, whereas externalizing services not using contingency management showed only a small effect (see Table 5). In

contrast, contingency management did not demonstrate a significant advantage among school-based services targeting internalizing problems (see Table 5).

Whether studies drew upon ITT analyses predicted heterogeneity in service effects ($Q_{Between}$[df=2] =11.96, p=.003), with ITT studies yielding medium effects (Hedges' g=0.51) and studies not conducting ITT analyses yielding small effects (Hedges' g=0.17).

Sensitivity Analysis

A sensitivity analysis based on Vevea and Woods[32] found that correcting for moderate one-tailed, moderate two-tailed, and severe two-tailed selection bias had minimal effects on the outcome (Hedges' g=0.30, Hedges' g=0.39, and Hedges' g=0.38, respectively, relative to the overall Hedges' g=0.39 presently estimated, with all confidence intervals overlapping). These findings give relative confidence that the estimated pooled effect of school-based programs has not been meaningfully inflated by the exclusion of "missing" studies from the present meta-analysis. However, correcting for a hypothetical severe one-tailed selection bias did meaningfully deflate the estimated effect (Hedges' g=-1.32). Despite the robustness of the estimated effects against most types of publication bias, it is important to acknowledge that we cannot rule out the possibility that the presently estimated effects may nonetheless be affected by a very specific pattern of severe publication bias.

DISCUSSION

The present meta-analysis synthesized the empirical literature on controlled evaluations of elementary school-based mental health services delivered by school personnel, computing overall pooled effects across studies, and determining factors associated with variations in the effects. Services delivered by school-based personnel collectively demonstrated a small-to-medium effect on child mental health problems, with particularly large effects associated with

targeted interventions and selective prevention, services that included contingency management, services that were integrated into academic instruction, services that were implemented multiple times per week or daily, and services that targeted externalizing problems. These findings build on prior reviews[27,28,73,74] and provide quantitative support for prioritizing the integration of mental health care within school settings.[73,75] Against a concerning backdrop of serious problems in the accessibility of evidence-based treatments for youth,[13,14,76] the present meta-analysis provides evidence of the important role that school-based personnel who are naturally in children's lives can play in implementing mental health services.

Notably, universal prevention showed somewhat weaker effects relative to more targeted services. This is consistent with previous qualitative reviews and meta-analyses[27,77] and may reflect floor effects commonly found in prevention science when intervening with an entire population rather than with a selected subset of individuals with more documented need.[78] Importantly, despite the relatively weaker effects observed for universal prevention, small effects can still yield large impacts.[79] Indeed, universal prevention can play a critical role in reaching a larger population of children, can reduce stigma by including all children, and can increase school and parent involvement.[27,80] Although the present findings document particularly encouraging outcomes associated with selective prevention and targeted interventions and underscore the need to more broadly promote their uptake in schools, universal preventions must nonetheless remain a critical component of school-based mental health care.

Service duration did not differentially predict program effectiveness, consistent with prior research observing the absence of a "dose response" in clinic-based services.[89] Given concerns about feasibility, sustainability, and cost-containment,[22,82] it is encouraging that relatively brief school-based services seem to show comparable effects relative to more burdensome long-term

interventions. That said, service intensity did predict important differences in outcomes, with more frequently delivered services showing stronger effects than less frequently delivered services. Collectively, these findings suggest that how long a school-based mental health program is implemented matters less than how frequently it is delivered.

Striking disparities persist in the accessibility of mental health care, with economically disadvantaged and ethnic/racial minority children less likely to receive needed services than their upper-to-middle class, non-minority peers.[15,17,18] Present support for the effectiveness of elementary school-based mental health services is particularly encouraging given that school-based delivery of care can overcome many of the key barriers faced by low-income and ethnic/racial minority children and families (e.g. stigma, cost, transportation).[15] Among studies presenting income and race/ethnicity data, roughly half of children were identified as coming from economically disadvantaged and ethnic/racial minority backgrounds (a higher proportion than in clinic-based mental health research),[11] and the effectiveness of school-based services did not differ as a function of these demographic factors. The current findings further support the critical role of school-based services as a promising vehicle for extending the reach of children's mental health care and for reducing disparities in the quality and accessibility of needed services. That said, approximately 42% of the studies presently reviewed did not contain information on SES, and 28% did not contain information on minority status, suggesting the study of school-based service delivery in schools serving low-income minority children should be prioritized to ensure feasibility and sustainability in these resource-strained settings. We must acknowledge that low-resourced schools may not have the personnel or expertise to implement mental health services without support. Indeed, recent work has expressed the need for an ecological model of

school mental health utilizing indigenous school and community resources to form community mental health and school partnerships.[22,83]

Importantly, teachers, whose primary role is academic instruction, provided the majority of evaluated mental health services whereas school counselors and mental health workers provided only 2% of evaluated services. This finding is concerning given the intended role of school counselors and school mental health professionals is to support student mental health.[22] Given the high rate of teachers implementing the evaluated services, it is perhaps not surprising that mental health services integrated into students' academic instruction showed stronger outcomes than services that were not integrated into academic education. Such integrated services embed mental health content into teachers' natural roles and functions as academic educators and classroom managers. Curriculum-driven SEL services and pull out mental health programs go beyond the primary role of teachers and may accordingly be more difficult to implement. Indeed, teachers may need additional support and resources when mental health services extend them beyond their primary roles and require task shifting.[22] Priority should be given to school-based services that match the natural roles and functions of those personnel charged with implementation.[22] Additionally, as the vast majority of evaluated services were implemented by teachers, controlled evaluations are now needed of school-based services delivered by school counselors, psychologists, and social workers to optimally inform the efficient structuring of services provided by different school-based professionals across the RtI tiers.

Several limitations warrant comment. First, we limited this meta-analysis to only include controlled evaluations. Findings, therefore, are not representative of all school-based mental health services, but rather speak to the pooled effectiveness of the most rigorous of

investigations. Second, we focused on mental health outcomes, and a number of key outcomes important to child development (e.g., social and emotional knowledge, peer functioning, academic outcomes) were not included. Similarly, a number of key implementation-related variables (e.g. fidelity, feasibility) were not included. Regrettably, very few studies have consistently evaluated these important variables,[26] precluding an opportunity to meta-analyze these outcomes. Future investigations of school-based mental health programs would do well to include a wider breadth of outcomes and implementation-related variables. It is particularly noteworthy and concerning that only a small handful of studies of school-based mental health programs included data on academic outcomes, despite continued calls to better align the goals of student mental health and academic success.[22,73,82] Third, we only included data that had undergone peer review, and it is possible that including unpublished findings would have yielded different results. There is continued debate about the utility of including unpublished data in meta-analyses.[84] Importantly, the present sensitivity analyses suggested that moderate publication bias would not have influenced the interpretation of these results, although a severe and specific pattern of publication bias would have yielded different results. Fifth, although the present findings identified a number of seemingly effective program features, overlapping components across programs may have inflated effectiveness associated with individual components. For example, 95% of services using contingency management occurred daily or multiple times per day, and as such it is not possible to disentangle the extent to which the effectiveness of such programs was due to the incorporation of contingency management or to the high intensity of treatment implementation. Future dismantling studies might do well to experimentally examine the unique contributions of various treatment components associated with stronger effectiveness. Sixth, the majority of studies did not incorporate long-term

evaluations, and among the small proportion that did there was tremendous variability in the length of the follow-up interval. As such, the present meta-analysis only evaluated acute outcomes and, thus, cannot speak to the maintenance or long-term durability of outcomes. Seventh, the low number of services targeting substance abuse may have limited the power with which to detect the effects of such services. That said, we only examined outcomes at posttreatment; given relatively low rates of substance use in elementary-aged children, follow-up evaluations might have yielded more positive effects.

Despite these limitations, the present meta-analysis provides the first empirical synthesis of the acute effects of mental health services delivered by school personnel for elementary-age students. Whereas many efficacy investigations of school-based mental health programs have incorporated outside research staff to implement services, the current meta-analysis was restricted to effectiveness evaluations that relied exclusively on personnel indigenous to the school environment for service implementation and thus speaks more directly to matters of implementation feasibility, generalizability, and sustainability. The very positive findings observed—particularly for services that are more directly related to teachers' roles (integrated services), occur more frequently, contain contingency management, and target externalizing problems—underscore the critical importance of collaborative partnerships and communication between school personnel and child psychiatrists (and other mental health care professionals). Recognizing the effective role school personnel can play in children's mental health care and the serious problems in the accessibility and acceptability of office-based care, child psychiatrists are encouraged to increase referrals to school mental health programs for elementary-aged children. Additionally, findings provide important implications for principals and policymakers to consider how to strategically allocate funds for services that are most appropriate for delivery by

school-based personnel. Continued efforts documenting the cost-effectiveness of such services, particularly in the context of needed efforts to promote proper support for the sustainability of school-based mental health services,[22] are needed to meaningfully expand the integration of mental health services within the school setting.

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Table 2. Characteristics of Studies Examining Effects of School Mental Health Services (K=43; Total N=49,941)

Characteristics of children evaluated		
	% of youth	**Mean (SD)**
Male	52.0	
Low SES[a]	53.0	
Ethnic/racial minority[b]	57.1	
Grade		2.03 (1.49)
Characteristics of services evaluated		
	% of studies	
Mental health problem targeted[c]		
Externalizing problems	62.8	
Internalizing problems	41.9	
Attention problems	16.3	
Substance use	16.3	
Service level		
Universal	69.8	
Selective	18.6	
Targeted	11.6	
Service intensity[d]		
Daily	44.2	
Multiple times a week	18.6	
Weekly or less	34.9	
Service duration		
1-12 weeks	30.2	
13 weeks-1 year	46.5	
More than 1 year	23.3	
Service integration		
Yes	30.2	
No	69.8	
Service implementers		
Teacher	88.4	
Paraprofessional	4.7	
School mental health provider	4.7	
Parent volunteer	2.3	

Note: SES = socioeconomic status.
[a] 58.1% of studies included SES data
[b] 72.1% of studies included minority status data
[c] Studies reported here overlap, as many services targeted multiple problems
[d] One study did not report intensity

Table 3. Results of Analyses Examining Effectiveness of School-Based Mental Health Services Across Domains of Student Problems (K=43, N=49,941)

Clinical outcome	*k*	Hedges' *g*	SE	95% CI	*Z*	Test of heterogeneity
All outcomes	43	0.39	0.05	[0.29, 0.49]	7.60***	*Q*=975.80, df=42, *p*<.001, I-squared=95.70
Externalizing Problems	27	0.50	0.07	[0.35, 0.63]	6.82***	*Q*=887.73, df=26, *p*<.001, I-squared=97.07
Internalizing Problems	18	0.30	0.07	[0.16, 0.43]	4.30***	*Q*=185.19, df=17, *p*<.001, I-squared=90.82
Attention Problems	7	0.10	0.04	[0.03, 0.17]	2.67*	*Q*=15.204, df=6, *p*=.019, I-squared=60.54
Substance use	7	0.18	0.16	[-0.15, 0.50]	1.07	*Q*=182.535, df=6, *p*<.001, I-squared=96.71

Note: * $p < .05$, *** $p < .001$

Table 4. Results of Analyses Examining Potential Moderators of Response to School-Based Mental Health Services (K=43, N= 49,941)

Predicting all student problems						
Categorical Moderator/Subgroup	***k***	**Hedges' *g***	**SE**	**95% CI**	***Z***	**Test of moderation**
Service level						$Q_{Between}$=9.67, df=2, *p*=.008
Universal prevention	30	0.29	0.05	[0.26, 0.45]	5.26***	
Selective prevention	8	0.67	0.13	[0.42, 0.92]	5.30***	
Targeted intervention	5	0.76	0.30	[0.19, 1.34]	2.60*	
Service intensity						$Q_{Between}$ =28.15 df=3, *p*=.000
Daily	19	0.45	0.07	[0.30, 0.60]	6.05***	
Multiple per week	8	0.50	0.16	[0.20, 0.81]	3.26**	
Weekly or less	15	0.21	0.07	[0.08, 0.34]	3.10**	
Service integration						$Q_{Between}$ =4.80, df=1, *p*=.030
Yes	13	0.59	0.11	[0.37, 0.80]	5.23***	
No	30	0.31	0.06	[0.19, 0.43]	5.16***	
Service duration						$Q_{Between}$ =3.80, df=2, *p*=.150
1-12 weeks	13	0.49	0.14	[0.222, 0.72]	3.59**	
13-36 weeks	20	0.28	0.06	[0.16, 0.40]	4.62***	
>1 year	10	0.48	0.11	[0.27, 0.69]	4.39***	
Continuous Moderator	***k***	□	**SE**	**95% CI**	***Z***	**Test of moderation**
Service duration	43	-0.00	0.00	[-0.00, 0.00]	-0.08	*Q*=0.01, df=1, *p*=.937
Mean grade	40	-0.04	0.03	[-0.11, 0.02]	-1.25	*Q*=1.57, df=1, *p*=.211
% low SES students	26	-0.00	0.00	[-0.01, 0.00]	-1.57	*Q*=2.47, df=1, *p*=.116
% racial/ethnic minority students	32	-0.00	0.00	[-0.01, 0.00]	-0.93	*Q*=0.86, df=1, *p*=.352

Note: SES = socioeconomic status. * $p < .05$, ** $p < .01$, *** $p < .001$

Table 5. Results of Meta-Analyses, With and Without Contingency Management

	K	Hedges' g	SE	95% CI	Z	Test of moderation
All Outcomes						
With contingency management	18	0.57	0.10	[0.37, 0.78]	5.51***	$Q_{Between}$=8.11, df=1, *p*=.004
Without contingency management	25	0.24	0.05	[0.15, 0.34]	4.95***	
Specific outcome domains						
Externalizing						
With contingency management	15	0.69	0.13	[0.43, 0.95]	5.18***	$Q_{Between}$=11.93, df=1, *p*=.001
Without contingency management	12	0.19	0.06	[0.08, 0.30]	3.43**	
Internalizing						
With contingency management	4	0.26[a]	0.12	[0.02, 0.50]	2.11*	$Q_{Between}$=0.12 df=1, *p*=.732
Without contingency management	14	0.31	0.09	[0.14, 0.46]	3.65***	

Note: * $p < .05$, ** $p < .01$, *** $p < .001$

[a] Pooled effect sizes based on less than 5 studies should not be interpreted as reliable estimates.

Figure 1. Flow diagram of study selection processes.

Figure 2. Forest plot of overall study effects. Note: CPPRG = Conduct Problems Prevention Research Group.

Table 1. Characteristics of Studies Included in Present Meta-Analysis That Examined School-Based Mental Health Programs for Elementary-Aged Children in Which School-Based Personnel Implemented Services

Study	Program	Service Level	Implementer	Frequency	Duration	Targeted Outcomes Included in Meta-Analysis	Baseline Sample Size			Primary Outcome Analysis	ITT Analyses
							Total Study	Intervention Group	Control Group(s)		
Barrett & Turner (2001)[33]	Friends for Children	Universal	Teacher	1-4x Per Month	1-12 Weeks	Internalizing	588	263	No services = 188; Psychologist-led program =137	Mixed factorial ANOVA	No
Baum et al. (2013)[34]	Building Resilience Intervention	Selective	Teacher	[a]	1-12 Weeks	Internalizing	563	254	309	Multiple regression	No
Beets et al. (2009)[35]	Positive Action	Universal	Teacher	2-4x Per Week	<1 year	Substance Use, Externalizing	1714	976	738	Overdispersion random-effects poisson model	[a]
Berger et al. (2009)[36]	ERASE Stress Sri Lanka	Selective	Teacher	1-4x Per Month	13-36 Weeks	Internalizing	166	84	82	Repeated measure ANOVA	Yes
Berger et al. (2007)[37]	Overshadowing the Threat of Terrorism	Universal	Teacher	1-4x Per Month	13-36 Weeks	Internalizing	142	70	72	Repeated measure ANOVA	Yes
Botvin et al. (2003)[38]	Life Skills Training	Universal	Teacher	1-4x Per Month	<1 year	Substance Use	1954	[a]	[a]	GLM ANCOVA	No
Bradshaw et al. (2012)[39]	School-Wide Positive Behavioral Interventions and Supports	Universal	Teacher	Daily	<1 year	Externalizing, Attention Problems	12344	6971	5373	HLM	No
Cheney et al. (2009)[40]	Check, Connect, Expect	Selective	Para	Daily	<1 year	Externalizing, Internalizing	280	168	112	HLM	No
Clarke et al. (2014)[41]	Zippy's Friends	Universal	Teacher	1-4x Per Month	13-36 Weeks	Externalizing, Attention Problems	766	544	222	Structural Equation Modeling	Yes
CPPRG (1999)[42]	PATHS	Universal	Teacher	Daily	<1 year	Externalizing	6715	[a]	[a]	HLM	No

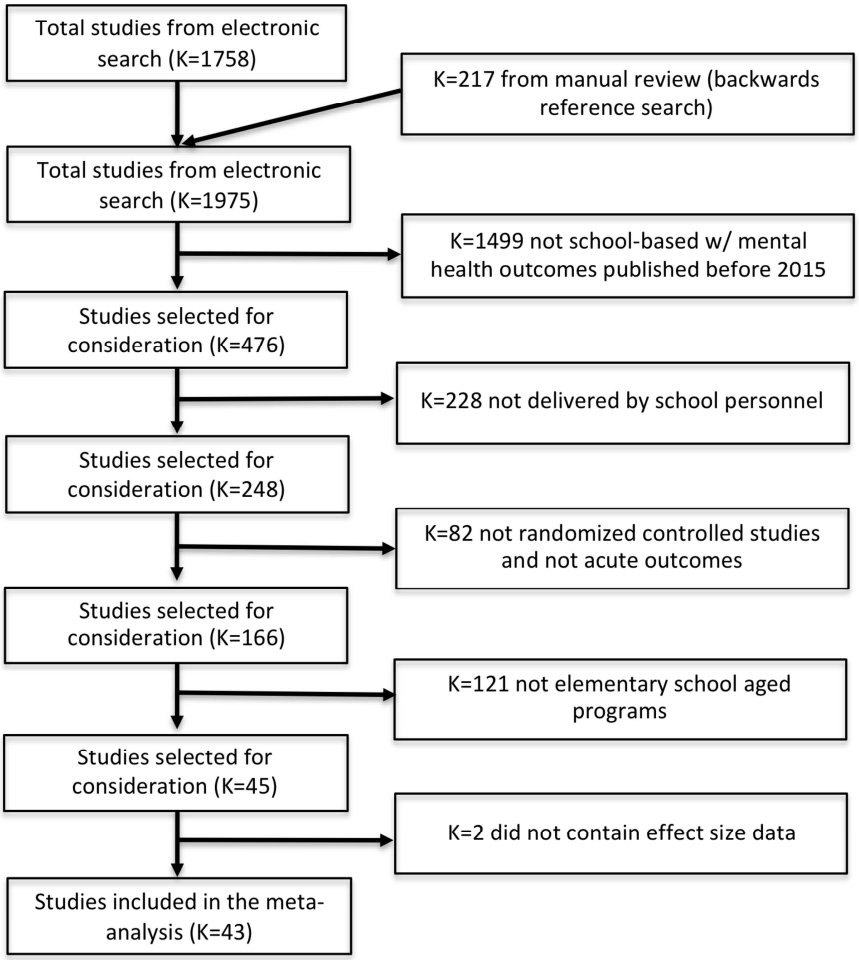
CPPRG (2010)[43]	Fast Track PATHS	Universal	Teacher	Daily	<1 year	Internalizing, Externalizing, Attention Problems	2937	[a]	[a]	Multilevel Logistic Regressions	Yes
Crean et al. (2013)[44]	PATHS	Universal	Teacher	2-4x Per Week	13-36 Weeks	Externalizing	779	422	357	3 level growth models with HLM	No
Daunic et al. (2006)[45]	Tools for Getting Along	Selective	Teacher	2-4x Per Week	1-12 Weeks	Externalizing	79	42	37	HLM	No
Daunic et al. (2012)[46]	Tools for Getting Along	Universal	Teacher	1-4x Per Month	13-36 Weeks	Externalizing	1296	[a]	[a]	Multilevel Modeling	No
Dion et al. (2011)[47]	GBG + Peer Tutoring	Universal	Teacher	Daily	13-36 Weeks	Attention Problems	409	[a]	No services=[a]; Peer tutoring =[a]	Regression	[a]
Dolan et al. (1993)[48]	Good Behavior Game	Universal	Teacher	2-4x Per Week	13-36 Weeks	Externalizing, Internalizing	501	182	Internal Control= 107; External Control= 212	ANCOVA	[a]
Flannery et al. (2003)[49]	Peace Builders	Universal	Teacher	Daily	<1 year	Externalizing	4128	2411	1717	HLM	[a]
Forster et al. (2012)[50]	Behavior Management	Targeted	Teacher	Daily	13-36 Weeks	Externalizing	100	60	40	Repeated measures ANOVA	Yes
Grossman et al. (1997)[51]	Second Step: A Violence Prevention Curriculum	Universal	Teacher	2-4x Per Week	13-36 Weeks	Externalizing	790	418	372	Generalized estimating equation regression	[a]
Hecht et al. (2008)[52]	Keepin' it REAL	Universal	Teacher	1-4x Per Month	13-36 Weeks	Substance Use	1566	768	798	Random coefficients model	Yes
Holen et al. (2012)[53]	Zippy's friends	Universal	Teacher	1-4x Per Month	13-36 Weeks	Externalizing, Emotion, Attention Problems	1324	686	638	SEM	Yes
Hutchings et al. (2013)[54]	IY Teacher Classroom Management	Universal	Teacher	Daily	13-36 Weeks	Externalizing	107	53	54	HLM	Yes

Ialongo et al. (1999)[55]	Classroom Centered	Universal	Teacher	1-4x Per Month	13-36 Weeks	Mental Health, Externalizing, Internalizing	[a]	[a]	[a]	Mixed model analysis	Yes
Ialongo et al. (1999)[55]	Family School Partnership	Universal	Teacher	1-4x Per Month	13-36 Weeks	Mental Health, Externalizing, Internalizing	[a]	[a]	[a]	Mixed model analysis	Yes
Iovannone et al. (2009)[56]	Prevent Teach Reinforce (PTR)	Targeted	Teacher	Daily	1-12 Weeks	Externalizing	245	[a]	[a]	Repeated measure ANOVA	Yes
Kapalka (2006)[57]	Reducing Repetitions	Targeted	Teacher	Daily	1-12 Weeks	Externalizing	86	45	41	Repeated measure ANOVA	[a]
Kraag et al. (2009)[58]	Learn Young, Learn Fair	Universal	Teacher	Daily	13-36 Weeks	Internalizing	1467	710	757	Mixed (multilevel) regression	No
Kumpfer et al. (2002)[59]	I Can Problem Solve	Universal	Teacher	2-4x Per Week	13-36 Weeks	Externalizing	578	256	322	Change scores	No
Kupersmidt et al. (2010)[60]	Media Detective	Selective	Teacher	Daily	1-12 Weeks	Substance Use	[a]	[a]	[a]	HLM	No
Kupersmidt et al. (2010)[60]	Media Detective	Universal	Teacher	Daily	1-12 Weeks	Substance Use	[a]	[a]	[a]	HLM	No
Lewis et al. (2013)[61]	Positive Action	Universal	Teacher	2-4x Per Week	13-36 Weeks	Internalizing	1170	[a]	[a]	SEM	Yes
Li et al. (2011)[62]	Positive Action	Universal	Teacher	2-4x Per Week	13-36 Weeks	Substance Use, Externalizing	620	310	310	Three level overdispersed poisson models	No
Miller et al. (2011)[63]	FRIENDS	Universal	Teacher	1-4x Per Month	1-12 Weeks	Internalizing	191	65	126	Linear growth model using HLM	No
Miller et al. (2011)[63]	FRIENDS	Selective	Teacher	1-4x Per Month	1-12 Weeks	Internalizing	253	141	112	Linear growth model using HLM	No
Parker et al. (2014)[64]	Master Mind	Universal	Teacher	Daily	1-12 Weeks	Substance Use, Internalizing, Externalizing	111	71	40	PROC mixed analysis and HLM	[c]
Rooney et al. (2013)[65]	The Aussie Optimism	Universal	Teacher	1-4x Per Month	1-12 Weeks	Depression, Internalizing	910	467	443	Multi-level mixed effects regression	Yes

Seeley et al. (2009)[66]	First Step to Success	Targeted	School MH Provider, Teacher	Daily	1-12 Weeks	Externalizing, Attention Problems	42	23	19	ANCOVA	[a]
Suter & Kehle (1989)[67]	Primary Mental Health Project	Selective	Parent Volunteers	1-4x Per Month	13-36 Weeks	Mental Health Problems	26	14	12	ANCOVA	[a]
van Lier et al. (2004)[68]	Good Behavior Game	Universal	Teacher	Daily	<1 year	Externalizing	666	363	303	Multiple group analysis	Yes
Walker et al. (2009)[69]	First Step to Success	Selective	School MH Provider, Teacher	Daily	1-12 Weeks	Externalizing	200	101	99	Multivariate model, ANCOVA	Yes
Webster-Stratton et al. (2009)[70]	IY Teacher Classroom Management & Dinosaur School	Universal	Teacher	Daily	13-36 Weeks	Mental Health Problems	1768	[a]	[a]	Multilevel models	No
Witvliet et al. (2009)[71]	Good Behavior Game	Universal	Teacher	Daily	<1 year	Externalizing	758	501	257	Growth model	[a]
Wyman et al. (2010)[72]	Rochester Resilience Project	Targeted	Para	1-4x Per Month	13-36 Weeks	Internalizing, Externalizing, Attention Problems	226	111	115	Multilevel modeling	Yes

Note: ANCOVA = analysis of covariance; ANOVA = analysis of variance; GLM = general linear model; HLM = hierarchical linear modeling; ITT=Intent-to-treat analyses; IY = Incredible Years; MH = mental health.

[a] Study provided insufficient information.


Total studies from electronic search (K=1758)
K=217 from manual review (backwards reference search)
Total studies from electronic search (K=1975)
K=1499 not school-based w/ mental health outcomes published before 2015
Studies selected for consideration (K=476)
K=228 not delivered by school personnel
Studies selected for consideration (K=248)
K=82 not randomized controlled studies and not acute outcomes
Studies selected for consideration (K=166)
K=121 not elementary school aged programs
Studies selected for consideration (K=45)
K=2 did not contain effect size data
Studies included in the meta-analysis (K=43)

Study name	Hedges's g	Lower limit	Upper limit
Barrett, 2001	0.173	-0.045	0.392
Baum, 2013	0.969	0.716	1.222
Beets, 2009	0.991	0.877	1.105
Berger, 2007	1.458	1.089	1.828
Berger, 2009	1.121	0.793	1.449
Botvin, 2003	0.020	-0.102	0.141
Bradshaw, 2012	0.040	0.004	0.076
Cheney, 2009	0.709	0.425	0.993
Clarke, 2014	0.008	-0.149	0.164
CPPRG, 1999	0.049	0.001	0.097
CPPRG, 2010	0.098	0.026	0.171
Crean, 2013	0.210	0.048	0.373
Daunic, 2006	0.712	0.170	1.255
Daunic, 2012	0.005	-0.106	0.115
Dion, 2011	0.300	0.103	0.496
Dolan, 1993	0.288	0.075	0.501
Flannery, 2003	0.061	-0.000	0.122
Forster, 2012	0.631	0.221	1.040
Grossman, 1997	1.449	1.037	1.861
Hecht, 2008	-0.021	-0.120	0.078
Holen, 2012	0.000	-0.108	0.108
Hutchings, 2013	0.269	-0.109	0.647
Ialongo, 1999	0.268	0.079	0.458
Ialongo, 1999b	0.154	-0.034	0.342
Iovannone, 2009	0.715	0.457	0.973
Kapalka, 2006	2.206	1.673	2.739
Kraag, 2009	-0.086	-0.189	0.018
Kumpfer, 2002	0.270	0.094	0.446
Kupersmidt, 2010	0.398	0.041	0.754
Kupersmidt, 2010b	-0.060	-0.226	0.106
Lewis, 2013	0.155	0.040	0.270
Li, 2011	0.158	-0.017	0.332
Miller, 2011	0.261	-0.127	0.648
Miller, 2011b	-0.237	-0.857	0.384
Parker, 2014	0.178	-0.209	0.566
Rooney, 2013	0.114	-0.016	0.245
Seeley, 2009	0.080	-0.518	0.677
Suter, 1989	-0.355	-1.108	0.398
van Lier, 2004	2.265	2.035	2.495
Walker, 2009	0.911	0.620	1.201
Webster-Stratton, 2009	0.116	0.005	0.228
Witvliet, 2009	0.483	0.331	0.635
Wyman, 2010	0.214	-0.059	0.486
	0.389	0.289	0.490