ARTICLE

School-Based Violence Prevention Programs

Systematic Review of Secondary Prevention Trials

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Objective: To quantify the effectiveness of school-based violence prevention programs for children identified as at risk for aggressive behavior.

Design: Systematic review and meta-analysis of randomized controlled trials. Electronic databases and bibliographies were systematically searched and authors and organizations were contacted to identify randomized controlled trials. Standardized, weighted mean effect sizes were assessed by meta-analysis.

Setting: Elementary, middle, and high schools.

Participants: Children at risk for aggressive behavior.

Main Outcome Measures: Violent injuries, observed or reported aggressive or violent behaviors, and school or agency responses to aggressive behaviors.

Results: Of the 44 trials identified, none reported data on violent injuries. For the 28 trials that assessed aggressive behaviors, the pooled difference between study groups was –0.36 (95% confidence interval, –0.54 to –0.19) in favor of a reduction in aggression with intervention. For the 9 trials that reported data on school or agency responses to aggression, the pooled difference was –0.59 (95% confidence interval, –1.18 to 0.01). Subgroup analyses suggested greater effectiveness in older students and when administered to mixed-sex groups rather than to boys alone.

Conclusions: School-based violence prevention programs may produce reductions in aggressive and violent behaviors in children who already exhibit such behavior. These results, however, need to be confirmed in large, high-quality trials.

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In 1998 in the United States, 43 of every 1000 children were victims of nonfatal violent crime while at school or on their way to and from school.[1] More than 250 000 serious violent crimes (1% of all schoolchildren), including rape, sexual assault, and aggravated assault, were committed against students at school or while going to or from school. Teachers are also victims of school violence, with 31 per 1000 teachers reporting violent crime victimization in 1998. Youth violence in the school has become an increasing concern in the United States and other nations.[2,3]

Many schools have implemented prevention programs that attempt to address this problem. According to a US Surgeon General's report, "Hundreds of youth violence prevention programs are being used in schools and communities throughout the country, yet little is known about the actual effects of many of them."[2,4] Although previous reviews have attempted to identify model programs and best practices,[2,4] informed decision making by policymakers and school professionals about violence prevention programs requires ready access to information about the effectiveness of such programs based on systematic and comprehensive review and synthesis of

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all available literature. The most reliable evidence for effectiveness comes from randomized controlled trials.[5] We therefore conducted a systematic review and meta-analysis of such trials to explore and quantify the effect of school-based violence prevention programs on aggressive and violent behaviors in children at high risk for violent behavior.

RESULTS

We identified 9286 unduplicated electronic records, from which 274 potentially relevant reports were identified and the full texts examined. Thirty-five eligible trials[12,13,18-21,24-52] were found. An additional 3 trials[10,11,17] were identified from authors, 2[33,53] from bibliographies, and

METHODS

INCLUSION CRITERIA

Studies were included if (1) participants were randomly assigned to intervention and control groups; (2) outcome data were collected concurrently in the 2 groups; (3) the study population was composed of children in grades kindergarten (K) through 12 (or their international equivalent) identified by author-defined criteria as exhibiting or at risk for aggressive behavior; (4) the experimental intervention was designed, either wholly or largely, to reduce aggression and violence; (5) the intervention was primarily school based, although it could contain additional components; and (6) outcome measures included aggressive behavior, school and agency responses to acts of aggression, or violent injuries. We defined outcome measures as follows. Aggressive behavior was defined as scores on standardized tests that assess aggressive behavior (eg, Achenbach Child Behavior Checklist, Miller School Behavior Checklist) or actual counts of aggressive behaviors, such as fights or bullying (eg, via classroom observation and videotapes). School or agency actions were defined as any school or agency actions, such as detention, suspension, or court contact, recorded in official records that were taken in response to aggressive behaviors (eg, fighting and bullying). When school or agency records did not differentiate between responses to aggressive behaviors and responses to nonaggressive misbehaviors, such as truancy, all types of misbehaviors were included. The last outcome measure was violent injuries (eg, emergency department attendances).

For studies with multiple outcome measures, 1 aggressive behavior and 1 school or agency action outcome were chosen on the basis of a predefined hierarchy of factors (in order, data availability, measure specificity, quality assurance of measure, outcome assessor, data completeness and validation of the measure) and random choice if none of these applied (details available from the authors). We did not assess outcomes indirectly related to violence, such as school achievement, knowledge about or attitudes toward violence, mental health outcomes, and measures of aggressive responses to artificial stimuli or experimental tasks. We excluded cluster randomized trials with only 2 randomized schools or classes in which confounding factors cannot be effectively eliminated by randomization.

SEARCH STRATEGY

To identify relevant trials, electronic databases were searched using content terms such as *aggress**, *violen**, and *fight**, with terms such as *school**, *educat**, and *student**. The results were combined with the Cochrane Collaboration's optimally sensitive search strategy to identify controlled trials, adapted as required for each database (full search strategy available from the authors). We searched the Cochrane Controlled Trials Register (1998, issue 1), MEDLINE (1994–June 1998), EMBASE (1980–January 1998), PsycLIT (1887–March 1998), ERIC (Educational Resource Information Centre) (1970–September 1997), CINAHL (Cumulative Index to Nursing and Allied Health Literature) (1982–April 1998), Dissertation Abstracts (1861–March 1998), IBSS (International Bibliography of Social Sciences) (1952-1998), and NCJRS (National Criminal Justice Reference Service) (1970–May 1999) and the bibliographies of published reviews[6-8] and relevant trials. *Aggression and Violent Behavior* (Issue 1, 1996–Issue 3, 1998) were hand searched. We contacted relevant international organizations and experts and attempted to contact the authors of relevant studies to identify unpublished and internal reports. No language or date restrictions were applied.

STUDY SELECTION

Titles, abstracts, and keywords of identified records were screened to exclude ineligible trials (if specified in sufficient detail). Full texts of remaining reports were reviewed and additional ineligible trials excluded. Authors were contacted for clarification where necessary.

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4[54-57] from expert contacts, giving 44 randomized controlled trials of secondary violence prevention programs. Five authors provided additional data.[26,37,42,52,53] We received responses from 66% of all trial authors contacted. No trials reported data on violent injuries. Trial details are shown in the Table.

MAIN ANALYSES

Thirty-eight trials compared the intervention to a no intervention or placebo (ie, alternative classroom activity) control group and measured aggressive behavior. Twenty-three had complete data, 5 reported group means alone but the SD could be imputed, and 10 reported only partial or no data, giving 28 trials for analysis. Of these, 5 adjusted posttest results for pretest scores. Combining these 28 trials (**Figure 1**), aggressive behavior was reduced in intervention compared with control groups after intervention (ES, –0.36; 95% CI, –0.54 to –0.19). A test for heterogeneity was significant ($P<.001$), indicating variation in results across trials. Results were similar for 6 trials that collected data to 12 months after intervention (ES, –0.35; 95% CI, –0.79 to 0.09, with significant heterogeneity; $P<.001$), suggesting that effects were maintained.

Results were similar for different types of training. Training in skills of nonresponse produced beneficial effects on aggressive behavior immediately after intervention (ES, –0.38; 95% CI, –0.65 to –0.11, with significant heterogeneity; $P=.001$) and at 12 months (ES, –0.56; 95% CI, –1.08 to –0.05, without heterogeneity; $P=.38$). Interventions to improve relationship skills or social context also reduced aggressive behavior after intervention (ES, –0.65; 95% CI, –1.05 to –0.25, without heterogeneity; $P=.24$). One trial measured this outcome at 12 months (ES, –0.50; 95% CI, –0.97 to –0.04).

Among 15 trials that measured effects on school or agency actions, 6 published no data and the authors either could not provide data or could not be contacted. The pooled ES among 9 included trials was –0.59 (95% CI, –1.18 to 0.01), indicating a reduction in school or agency actions with intervention (**Figure 2**). There was significant

DATA EXTRACTION

From eligible reports, 2 of us (J.A.M. and C.D.) independently extracted detailed data on study participants, interventions, outcomes, follow-up, results, methods of group assignment and allocation concealment, blinding of outcomes assessment, and loss to follow-up. A third author (D.A.G.) also independently extracted data on participants, interventions, and outcomes. Differences were resolved by discussion. We attempted to contact all authors of eligible trials to confirm study details, obtain missing data, and identify relevant unpublished outcomes.

ANALYSIS

We compared results of any intervention to no intervention (ie, control or placebo group) immediately after intervention and at the 12-month follow-up in the subsample for which these data were collected. We also assessed the effect of different types of interventions, grouping them according to the predominant training focus: (1) skills of nonresponse, either managed (eg, conflict resolution) or not (eg, anger control); or (2) relationship skills and other interventions of social context (eg, family or social relationships, peer mediation).

Study-specific differences between intervention and control groups for each of these comparisons were pooled using meta-analysis[9] (RevMan 4.1; The Nordic Cochrane Centre, Copenhagen, Denmark) to produce an overall estimate of effect. Pooled results are expressed as standardized mean differences (with 95% confidence intervals [CIs]). In trials with multiple intervention or control groups, weighted, pooled means and SDs were used in the meta-analysis to avoid statistical problems with nonindependence of data that would result from including multiple intervention groups as separate trials. Studies comparing different intervention groups or different intensities of the same intervention, with no placebo or control group, were excluded from the meta-analysis but are described in the **Table**.[10-13]

Trial heterogeneity was explored with a χ^2 test using a significance level of .05.[9] If there was statistical evidence of heterogeneity, a random-effects model was used. We used formal statistical testing (using Stata statistical software, version 6; Stata Corp, College Station, Tex) and funnel plot analysis (in which study size is plotted against intervention effect)[14] to examine effects of study size and bias. In funnel plots, results from small studies tend to scatter widely at the bottom, with the spread narrowing among larger studies, so that the plot should represent a symmetrical inverted funnel. Asymmetry or gaps in the funnel plot may indicate that some studies or study data exist that may not have been published or located.[14] It may also indicate poor methodologic quality of smaller studies (which tend to show larger effect sizes [ESs]) or true heterogeneity in the results.[14,15] Exploration of heterogeneity by meta-regression, using covariates indicative of study quality such as allocation concealment, use of blinding, and type of intervention, was planned but could not be conducted because of inadequate reporting of such data.

When SDs were not published and could not be obtained, they were imputed by standard statistical methods[16] or derived from trials reporting the outcome in a similar population, where possible. Sensitivity analyses were performed on the effect of imputing SDs.

Six trials[11,17-21] used cluster randomization at the level of the class or school. Of these, 3 trials[11,19,20] did not report data suitable for inclusion. One trial[18] analyzed results by cluster. We analyzed the results of the other 2 trials[17,21] using a published intraclass correlation coefficient of 0.02 to take into account the cluster randomization.[22,23] As sensitivity analyses, we used more extreme values for the intraclass correlation coefficient (ie, 0.0001 and 0.1); there was no effect on results to one decimal place (data not shown).

Subgroup analyses specified a priori included assessing differences in intervention effects by whether the program was administered to primary or secondary school students and boys-only intervention groups vs mixed (or girls-only) groups. "Primary schools" included elementary schools (grades K through 5 or K through 6) or students of equivalent ages if grade was unspecified or study was international. "Secondary schools" included middle, junior high, and high schools (grades 6 through 12 or 7 through 12) or students of equivalent ages.

heterogeneity ($P<.001$). In 2 trials, there was no apparent effect at 12 months (ES, 0.05; 95% CI, –0.45 to 0.55).

Training in skills of nonresponse produced less conclusive beneficial effects on school or agency actions (ES, –0.32; 95% CI, –0.90 to 0.26, with heterogeneity; $P=.003$). Training to improve relationship skills or social context produced more favorable effects (ES, –0.69; 95% CI, –1.26 to –0.13), although only 2 trials were included.

SUBGROUP ANALYSES

Primary vs Secondary School

The immediate postintervention effect on aggressive behavior was similar for trials in primary schools (ES, –0.33; 95% CI, –0.54 to –0.12) and secondary schools (ES, –0.43; 95% CI, –0.75 to –0.11). Significant heterogeneity persisted within each subgroup (Figure 1).

There was no evidence of benefit from interventions in primary schools on school or agency actions (ES, 0.11; 95% CI, –0.48 to 0.70, without heterogeneity; $P=.05$). The remaining 7 studies, in secondary schools, showed a stronger positive effect of the intervention (ES, –0.82; 95% CI, –1.56 to –0.09, with significant heterogeneity; $P<.001$).

Sex

Most students identified as aggressive or violent were boys. Twelve trials[10,25,26,29,35-39,43,44,52] studied boys alone, 1 trial[13] studied girls alone, and the remaining 31 studied mixed groups in which most students were boys. Violence prevention programs delivered to boys alone had a modest effect on aggressive behavior (ES, –0.18; 95% CI, –0.47 to 0.1, without heterogeneity; $P=.18$), which may have been due to chance. The ES was greater for interventions delivered to mixed groups or girls alone (ES, –0.44; 95% CI, –0.66 to –0.23), although results were heterogeneous ($P<.001$). Two trials evaluating the effect of interventions on school or agency actions among male students alone reported no evidence of a benefit (ES, 0.22; 95% CI, –0.20 to 0.63, without heterogeneity; $P=.25$). Among 7 studies[17,18,24,28,32,45,51] of mixed-sex groups, there

Summary of Secondary Prevention Trials*

Source	Population	Randomization Method (Allocation Concealment Code†)	Intervention‡	Outcome Assessment and Postintervention Data Collection§
Booth[24] (1995), USA	53 Grade 6-8 students with repeated suspensions for aggressive behavior	Unspecified (B)	I: Group anger control training, 45 min for 12 sessions C: Usual school services (including counseling and referral if requested)	CBCL-TRF (unblinded) at 1 wk and 4 mo; school disciplinary referrals at 1 wk and 4 mo
Boswell[25] (1983), USA	62 Boys grades 3-6 referred by teacher for anger control problems	Unspecified (C: 4 boys put in intervention group on request of school counselor)	I1: Multimodal anger management and individual counseling, 10 sessions for 5-10 wk I2: Stress inoculation (Novaco approach) and individual counseling, 10 sessions for 5-10 wk C: No intervention	MSBC, teacher (blinded), timing unclear
Braswell et al[54] (1997), USA	309 Students grades 1-4 >1.75 SDs above norm on Conner Hyperactivity Index	Unspecified (B)	I: Minnesota Competence Enhancement Intervention for 2 y: social skills, anger management, conflict resolution, 45 min for 28 sessions; parent training, 2 h for 15 sessions; teacher training, 1-2 h for 17 sessions C: Parent and teacher information sharing sessions only	BASC (externalizing problems subscale), teacher (blinding unclear), at end of years 1 and 2
Camp et al[26] (1977), USA	23 Boys grade 2 ≥2 SDs above norm MSBC aggressive subscale	Drawing names from a bag (B)	I: "Think Aloud" (self-control), 30 min/d for 6 wk C: No intervention	MSBC (aggressive scale), teacher (unblinded), at 0-3 wk
Camp[10] (1980), USA	63 Boys grades 1-2 >65 on aggressive subscale of School Behavior Checklist	Coin toss (B)	I1: "Think Aloud" program and delayed refresher program, 30 min for 8 wk and refresher program I2: "Great Expectations" program (increased attention), 30 min for 8 wk and delayed refresher program ("Think Aloud" program)	MSBC (aggressive subscale), teacher (blinded) at 0 wk
Cavell and Hughes[11] (2000), USA	62 Grade 2-3 students ≥84th percentile on aggressive subscale of Achenbach CBCL	Unspecified (blocked by grade) (B)	I1: Therapeutic mentoring, weekly for 16 mo; parent and teacher consultation, weekly for 16 mo; problem-solving skills training, 60 min for 23 wk I2: Standard mentoring, 1 h per week for 16 mo	CBCL-TRF (aggression subscale), (blinding unclear) at 0 and 12 mo
Conduct Problems Prevention Research Group[17] (1999), USA	891 Grade 1 students with top 10% scores on teacher and parent aggression scales	Coin toss of matched pairs; cluster randomization (B)	I: Fast Track PATHS Curriculum (Promoting Alternative Thinking Strategies), 25-min lessons for 57 sessions for 8 mo; parent groups 120-min sessions for 22 sessions; home visiting, fortnightly, up to 12 times; academic tutoring C: No intervention	CBCL-TRF (externalizing scale), (blinding unclear) at 0 mo; use of special education services, from school records at 0 mo
Contreras[27] (1981), USA	22 Senior high school students, previously suspended and rated as aggressive (11/22 in special education, of whom 8 intellectually disabled)	Computer generated table of random numbers (B)	I: Structured Life Skills Program, 120 min for 5 wk P: Discussion group of song lyrics C: No intervention	Videotape recordings of physical aggression, independent observers (blinding unclear) at 0 and 1 wk; school suspensions, from school records
D'Elio[28] (1982), USA	480 Grade 7-9 students truant ≥15 d and referred to dean ≥4 times for aggressive or destructive behavior and suspended from school ≥2 times for criminal activity or serious aggressive or destructive behavior in previous year	Table of random numbers; open list (B)	I1: Individual conflict management, 90 min/wk for 9 mo I2: Family mediation I3: Peer group conflict management C: No intervention	Disciplinary referrals, from school records at 1 mo
Dauer[29] (1994), USA	98 Boys grades 6-7 nominated by principal for conduct and anger problems	Unspecified (B)	I: Anger management, 40 min for 8 wk C: No intervention	Conners Teachers Rating Scale 39 (conduct problem subscale), teacher (blinded) at 0 mo; disciplinary referrals, from school records at 0 mo

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Summary of Secondary Prevention Trials* (cont)

Source	Population	Randomization Method (Allocation Concealment Code†)	Intervention‡	Outcome Assessment and Postintervention Data Collection§
Day and Hartley[30] (1993), Canada	32 Students (aged 6-12 y) scoring >60 on externalizing subscale of CBCL-TRF	Coin toss of matched pairs (B)	I: Group cognitive skills training, 150 min for 12 wk; individual coaching, 30 min for 12 wk; family outreach; schoolwide social skills training C: Schoolwide social skills training only	CBCL-TRF (blinded) at 0 mo
Deffenbacher et al[31] (1996), USA	124 Grade 6-8 students scoring ≥75% on the Spielberger Trait Anger Scale	Table of random numbers (B)	I1: Relaxation and coping skills training, 45 min for 9 sessions I2: Social skills training C: No intervention	School deviance score, self-completed at 8 wk
Etscheidt[18] (1984), USA	30 Grade 6-12 students enrolled in school for chronically disruptive children	Drawn from hat; cluster randomization (B)	I1: Anger control program, 35 min for 12 sessions for 3 wk I2: Anger control program with behavioral reinforcement, 35 min for 12 sessions for 3 wk C: No intervention	Classroom observations of aggression, independent observer (blinded) at 3 wk; school behavior records, teacher (blinding unclear) at 3 and 7 wk
Feindler et al[32] (1984), USA	36 Students aged 12-15 y with ≥2 suspensions in previous year for offenses other than smoking or truancy	Unspecified (B)	I: Anger control training, 50 min for 10 sessions for 7 wk C: No intervention	Self-control rating scale, teacher (blinded) at 5 wk; school fines, school records, at 5 wk
Feshbach[33] (1979), USA	60 Grade 3-5 students, teacher nominated for aggressive behavior	Table of random numbers (B)	I1: Empathy training (cognitive and behavioral techniques), 180 min for 10 wk I2: Empathy training (cognitive only), 180 min for 10 wk P: Problem solving skills training, 180 min for 10 wk C: No intervention	Ratings of aggressive behavior, teacher (blinding unclear), timing unknown
Feshbach[33] (1979), USA	98 Grade 3-4 students teacher and peer nominated on ratings of social behavior	Table of random numbers (B)	I: Empathy training (affective and cognitive), 90 min for 10 wk P: Problem solving skills training, 90 min for 10 wk C: No intervention	Ratings of aggressive behavior, teacher (blinding unclear), at 0 and 6 mo
Forman[34] (1980), USA	20 Grade 3-5 students referred to school psychologist for aggressive behavior	Unspecified (B)	I1: Cognitive restructuring group, 60 min for 6 wk I2: Response cost program, 60 min for 6 wk P: Reading tutoring sessions	Classroom observation, teacher (unblinded) during last week of intervention
Garrison and Stolberg[35] (1983), USA	30 Grade 3-5 boys scored on CBCL and not already receiving psychological services or remedial education	Unspecified (B)	I: Affective imagery training, 35-min sessions for 3 sessions P: Attention group, 35-min sessions for 3 sessions C: No intervention	Behavior checklist, arguing subscale, teacher (blinded) at 0 mo
Gilberg[36] (1982), USA	30 Grade 7-12 boys identified as aggressive by teacher and school counselor	Unspecified (B)	I: Cognitive role taking training, 60 min for 8 wk P: Story telling, 60 min for 8 wk C: No intervention	CBCL-TRF (blinded) at 2 wk
Guerra et al[19] (1998), USA	870 Grade 2, 3, 5, and 6 students, "high risk" on Peer Nomination Index and CBCL	Random number draw; cluster randomization (B)	I1: Family relationship intervention, 75 min for 22 wk and C1 and I2 I2: Group sessions for at-risk children (peer relationship training), 60 min for 10 wk (year 1) and 16 wk (year 2) and C1 C1: Classroom social-cognitive curriculum (prosocial skills training), 60 min for 20 sessions (years 1 and 2) C2: No intervention	CBCL-TRF (aggression subscale), teacher (blinding unclear) at 0 and 12 mo; court record attendances at 0 and 12 mo
Harris et al[55] (1992), USA	67 Grade 1-2 students scoring >70th percentile on CBCL-TRF	Unspecified (C)	I: Teacher training, 12 wk C: No intervention	CBCL-TRF (blinded) at 0 mo
Hudley and Graham[37] (1993), USA	72 Grade 3-5 boys teacher nominated (Coie and Dodges teacher checklist, aggression subscale) and peer nominated (social preference score)	Table of random numbers (B)	I: Attributional retraining, 2 sessions/wk for 6 wk P: Attention group (thinking skills) 2 sessions/wk for 6 wk C: No intervention	Teacher checklist, total aggression subscale (blinded) at 0 mo; disciplinary referrals, school records at 3 mo

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Summary of Secondary Prevention Trials* (cont)

Source	Population	Randomization Method (Allocation Concealment Code†)	Intervention‡	Outcome Assessment and Postintervention Data Collection§
Hudley et al[38] (1998), USA	384 Grade 3-6 boys teacher nominated (Coie and Dodges teacher checklist, aggression subscale) and peer nominated (social preference score)	Table of random numbers (B)	I: Attributional retraining, 120 min for 6 wk P: Attention training (problem-solving skills and critical thinking), 120 min for 6 wk C: No intervention	Social Skills Rating System, Teacher Form (blinded) at 0, 6 and 12 mo; disciplinary referrals, school records at 0, 6, and 12 mo
Huey and Rank[39] (1984), USA	48 Grade 8-9 boys referred to school administrator for chronic classroom disruption	Table of random numbers (B)	I1: Assertion training (counselor led), 120 min for 4 wk I2: Assertion training (peer led), 120 min for 4 wk P1: Discussion group (counselor led), 120 min for 4 wk P2: Discussion group (peer led), 120 min for 4 wk C: No intervention	Walker Problem Behavior Identification Checklist, teacher (blinding unclear), at 0 mo
Hughes J[12] (1993), USA	51 Grade 2-3 students scoring ≥84th percentile on aggression and/or hostile isolation subscales of MSBC	Table of random numbers (but children in same family or classroom were assigned to same condition) (C)	I1: Problem solving skills training, 90 min for 10 wk I2: Teacher consultations, 30 min for 4 sessions	MSBC (aggression subscale), teacher (blinding unclear) at 0 mo
Hughes L[13] (1992), USA	20 Grade 10-11 girls in "at-risk" program and teacher nominated and ≥2 referrals in preceding school year for "conflict"	Unspecified (B)	1: Conflict management training, one school day I2: Conflict management discussion, 2 h	CBCL-TRF (aggressive subscale), (blinding unclear) at 2 wk; disciplinary referrals, from school records at 2 wk
Jones[53] (1991), Australia	18 Year 8-9 students with highest scores on the Achenbach CBCL for adolescents, aggression subscale	Drawn from hat (matched for sex) (B)	I1: Aggression replacement training (structured learning, anger management and moral reasoning training), 180 min for 10 wk I2: Moral reasoning training only, 60 min for 10 wk C: No intervention	Behavior incident reports (aggressive subscale), teacher (blinded) at 0 mo
Lee et al[40] (1979), Canada	30 Grade 9 students, peer nominated as aggressive	Unspecified (B)	I: Assertion training, 50 min for 8 wk P: Decision making, 50 min for 8 wk C: No intervention	Aggression rating scale, peers (blinding unclear) at 1 wk
Lochman et al[41] (1993), USA	24 Grade 3 students peer nominated as most liked, least liked, and most likely to fight	Unspecified (B)	I: Social problem-solving skills, 30 min for 26 individual sessions and 8 group sessions, for 6 mo C: No intervention	Behavior Checklist, aggression subscale, teacher (unblinded) at 0 mo, (blinded) at 12 mo
Mayer et al[20] (1983), USA	20 Grade 4-8 students randomly selected from predefined group with low literacy scores and spending ≥10% time off task	Unspecified, cluster randomization (school) (B)	I: Teacher training; workshops, consultations (twice weekly) and team meetings (twice monthly) for 1 y C: No intervention	Behavioral assessment instrument for disruptive behavior, observers (blinding unclear) at 0 mo; vandalism costs, school records at 0 mo
Meyer[42] (1995), USA	120 Grade 4-6 students referred >1 time to principal for inappropriate behavior	Table of random numbers (B)	I: Peer mediation training (conflict resolution), 2 d training, use of skills for 12 wk C: Use of peer mediation	Self-Perception Profile for Children–Teacher Rating Scale (behavioral conduct subscale) (blinding unclear) at 12 wk
Miller[43] (1990), USA	50 Grade 9-12 boys teacher nominated with behavior problems or considered at risk for delinquency	Subjects rank ordered on pretest scores and assigned by alternation (C)	I: Discussion group (sociomoral reasoning training), 45 min for 12 wk P: Discussion group (avoidance of self defeating behavior), 45 min for 12 wk C: No intervention	Adapted Dormitory Observation Report Form, verbal aggression subscale, teacher (blinding unclear) at 2 wk; court contacts, at 6 mo
Moody[44] (1981), USA	22 Grade 7-8 boys with ≥3 tally marks for aggression from teacher (1 wk observation period)	Table of random numbers (B)	I: Assertion training, 90 min for 5 wk P: Group counseling (decision making and communication skills), 90 min for 5 wk C: No intervention	Pittsburgh Adjustment Survey Scales, aggressive behavior subscale, teacher (blinding unclear) at 1 wk
Newton[45] (1994), USA	48 Grade 7-8 students scoring higher than median in 2 of 3 in-school violence measures	Rank ordered for scores, stratified random allocation (C)	I: Mentor program ≥60 min/wk of contact for 1 semester C: No mentoring program (but allowed to participate in other school programs designed to improve behavior, self-esteem, and academic performance)	Violence Index, school records, during mentoring period

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Summary of Secondary Prevention Trials* (cont)

Source	Population	Randomization Method (Allocation Concealment Code†)	Intervention‡	Outcome Assessment and Postintervention Data Collection§
Oldfield[46] (1982), USA	22 Grade 4-6 students with ≥10 incidents of violent or aggressive behavior during 25-d observation period (3 had learning difficulties)	Drawn from box (B)	I: Meditation training, 90-min training, then 15 min daily for 80 d P: Behavior charts training, 90-min training, then 15-min daily use for 80 d	Violent/Aggressive Incident Form, teacher (blinded) during last 25 d of intervention
Omizo et al[47] (1988), USA	24 Grade 4-6 students teacher nominated as aggressive	Table of random numbers (B)	I: Counseling sessions (cognitive behavior techniques), 45 min for 10 wk P: Watched films, 45 min for 10 wk	MSBC, aggression and hostile/isolation subscales, teacher (blinded) at 1 wk
Pepler et al[48] (1995), Canada	74 Grade 1-6 students teacher nominated for aggression, disruption, and noncompliance	Unspecified (B)	I: Social skills training (including some components of "Think Aloud" program, see Camp et al[26]) 150 min for 12-15 wk C: No intervention	CBCL-TRF (blinding unclear) at 0 mo
Prinz et al[21] (1994), USA	196 Grade 1-3 students (25 classes) (*a*) aggressive: scoring ≥65 on aggressive subscale of CBCL-TRF or (*b*) nonaggressive: scoring ≤60 on above scale and higher than median on communication effectiveness subscale of CBCL-TRF	Coin toss; cluster randomization and analysis (B)	I: Peer coping skills training and minimal classroom intervention (classwide program to promote prosocial behavior) 50 min for 19-24 wk C: Minimal classroom intervention only	CBCL-TRF (aggression subscale) (unblinded), at 0 and 6 mo
Quinn[49] (1995), USA	30 Students age 7 y scored as aggressive on CBCL-TRF, aggression subscale, with poor academic engagement and playground activity	Coin toss (B)	I: Cooperative learning (interpersonal problem solving skills), 15 min for 26 sessions for 6 wk C: No intervention	CBCL-TRF (aggression subscale) (blinding unclear), data collection unclear
Sackles[50] (1981), USA	35 Grade 6-8 students scoring ≥1 SD above group mean for anger (modified version of Anger Inventory Scale)	Unspecified (B)	I1: Stress inoculation, 45 min for 8 wk I2: Interpersonal cognitive problem solving, 45 min for 8 wk I3: Assertiveness training, 45 min for 8 wk C: No intervention	Devereux Behavior Rating Scale, teacher (blinding unclear), data collection unclear
Smith[51] (1991), USA	22 Grade 6-8 students, African American, teacher identified as having problems in 2 of 4 areas (truancy, academic failure, retention, and school adjustment)	Unspecified (B)	I: Social skills building, counseling, and material reinforcement, up to 120 min for 7 wk C: No intervention	Delinquency self-survey, data collection unclear; disciplinary referrals from school records, data collection unclear
Tanner and Holliman[56] (1988), USA	24 Grade 1-3 students, teacher nominated as aggressive	Unspecified (B)	I: Assertiveness social skills training, 120 min for 3 wk P: Attention control group, 120 min for 3 wk	Revised Parents Inventory of Children's Skills, teacher (blinded) at 0 mo
Tremblay et al[52] (1991), Canada	172 Kindergarten boys from French-speaking, Canadian-born families in low socioeconomic areas, scoring ≥70% on preschool behavior questionnaire for disruptive behavior	Computer-generated table of random numbers (B)	I: Social skills training, 9 sessions (year 1), 10 sessions (year 2); parents training, mean contact 17.4 sessions (variable); fantasy training (25/46), 12 sessions; critical television viewing (9/46), 9 sessions C1: No intervention C2: Sensitization contact: intensive home, school and laboratory assessments, and referrals	Social Behavior Questionnaire, teacher (unblinded), at 0 and 12 mo and 2, 6, and 7 y
Walker et al[57] (1998), USA	46 K-2 students, teacher nominated as aggressive using CBCL-TRF and poor academic engagement	Unspecified (B)	I: Teacher component (praise, points, and rewards), 40 min/d for 30 d and home component (parent guidelines and games), 60 min for 6 sessions C: No intervention	CBCL-TRF (aggression subscale) (blinded) at 0 and 12 mo

*CBCL indicates Child Behavior Checklist; TRF, teacher report form; MSBC, Miller School Behavior Checklist; BASC, Behavioral Assessment System for Children; and K, kindergarten.

†Allocation concealment codes: grade A, centrally controlled randomization, inaccessible onsite computer, sealed opaque sequentially numbered envelopes, computer-generated table of random numbers read by independent person; grade B, computer-generated table of random numbers read by person enrolling subjects (open list), coin toss, deck of cards, pick marbles, etc, other randomization scheme, unspecified; grade C, alternation, day of the week, date of birth, medical record number, or similar.

‡I indicates intervention; C, control; P, placebo group.

§Only instruments selected for inclusion in the meta-analysis are shown. Not all trials included data for these outcomes.

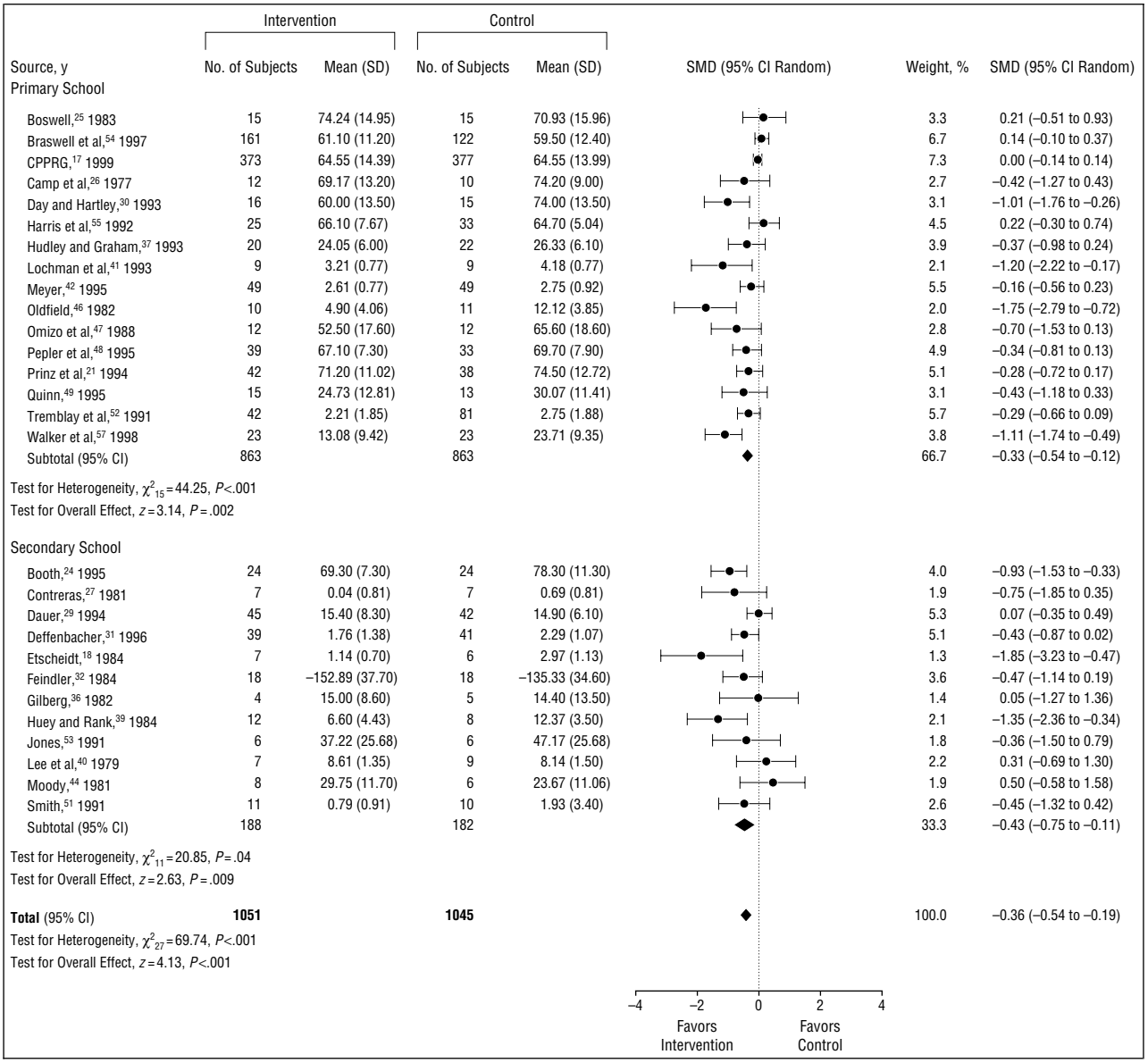

Figure 1. Comparison of any violence prevention intervention vs no intervention by type of school. The outcome was the difference in aggression scale score or observed aggression by type of school (after intervention). SMD indicates standardized mean difference; CI, confidence interval; and CPPRG, Conduct Problems Prevention Research Group.

was a substantial reduction in school or agency actions after intervention (ES, –0.85; 95% CI, –1.59 to –0.10, with significant heterogeneity; $P<.001$).

Effect of Imputing Data

The SD was imputed for 5 trials with incomplete reporting.[27,30,39,41,46] Omitting these data, the ES is –0.24 (95% CI, –0.40 to –0.08), a more modest effect than that found in the main analysis. The 5 studies with imputed data showed a strong effect (ES, –1.19; 95% CI, –1.62 to –0.76).

Evaluating Data for Heterogeneity and Publication Bias

The Begg test ($P=.07$) and Eggar test (bias coefficient $P<.001$) suggested a relationship between study size and reported effects on aggressive behavior (ie, larger studies reported smaller effects). This is illustrated in the funnel plot (**Figure 3**). The plot also demonstrates asymmetry, with fewer trials showing a positive standardized mean difference, suggesting that small studies showing harm or no benefit were not included.

COMMENT

School-based violence prevention programs for high-risk children modestly reduced both aggressive behaviors and school or agency actions. Training in nonresponse skills and in relationship skills both showed beneficial effects. Although the ESs appear small, the overall benefits may be substantial when implemented on a schoolwide or districtwide basis.

Effects on aggressive behavior were similar in primary and secondary schools, whereas effects on school or agency actions were greater in secondary schools, al-

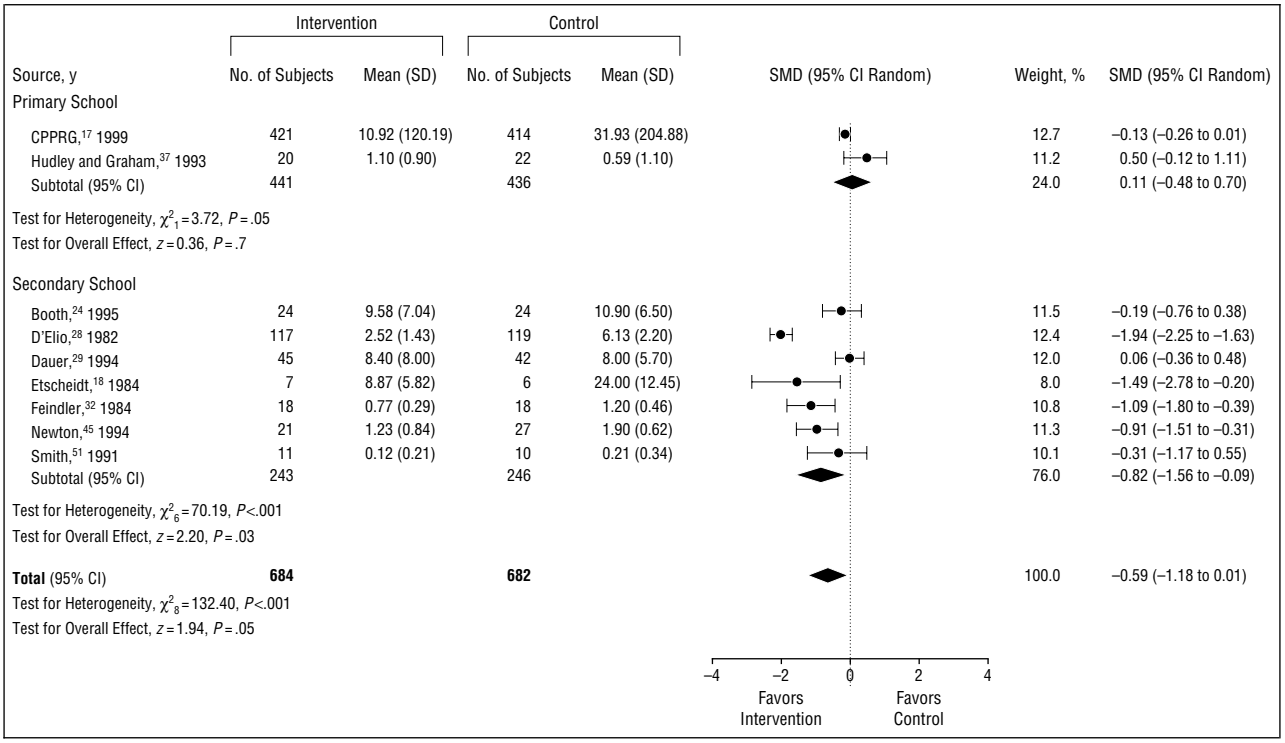

Figure 2. Comparison of any violence prevention intervention vs no intervention by type of school. The outcome was the difference in school or agency response to acts of aggression and other acts by type of school (after intervention). SMD indicates standardized mean difference; CI, confidence interval; and CPPRG, Conduct Problems Prevention Research Group.

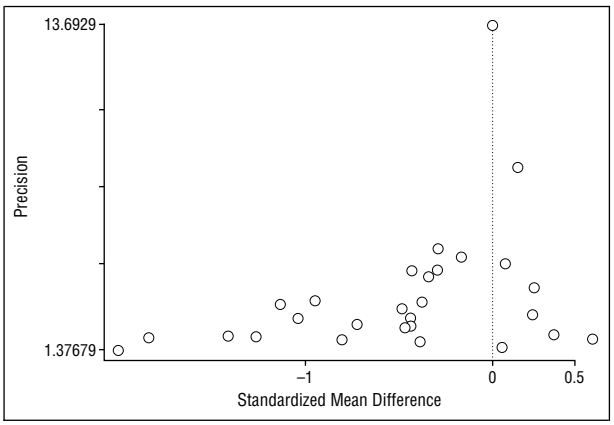

Figure 3. Funnel plot of measures of aggressive behavior for any school-based violence prevention program vs no program. The standardized mean difference demonstrates the treatment effect from each trial; the precision of the treatment effect is the reciprocal of the standard error.

though this difference may have been due to chance or to the way such actions are implemented at different ages. Although most programs focused solely or largely on boys, program effects appeared to be greater among mixed groups. Whether programs are more effective when delivered to mixed-sex groups or schools or whether such programs have greater effects on girls than on boys cannot be determined from these data.

Both subgroup analyses were prespecified, but, given the relatively small number of studies in each subcategory and the possibility of confounding by other trial characteristics, they should be interpreted with caution.

Tests for heterogeneity highlighted wide variation in the magnitude of results across trials. Funnel plot asymmetry is often used as an indication of publication bias, but it can also be explained by true heterogeneity among studies, resulting from differences in type or intensity of intervention, underlying risk, and study quality.[58] We found that differences in age group, sex, and training focus contributed to, but did not fully explain, the substantial heterogeneity. Trials in this review varied substantially in their quality, execution, and reporting. Most sample sizes were small, and many studies provided limited methodologic information (Table). Data on indicators of methods, such as allocation concealment, use of blinding, and type of intervention, were so poorly reported that exploration of heterogeneity by meta-regression was not possible. Therefore, we cannot make firm conclusions about the impact of these factors on the apparent heterogeneity.

All the trials selected students at high risk for violent or aggressive behavior. However, selection processes varied considerably. Because of inadequate information on these processes for most trials and difficulty in establishing population rates for the service actions on which selection was based, we could not explore whether program effectiveness differed according to how the study determined "high-risk" status.

Meta-analyses were performed on posttest results. Although randomized, most trials were relatively small. Therefore, differences in the pretest scores and other baseline characteristics (eg, age) may have occurred by chance. Unfortunately, the difference between the posttest and pretest means was not available for most studies. Posttest scores adjusted for pretest differences were used where available, otherwise unadjusted posttest scores were used.

The 5 studies[27,30,39,41,46] in which the SD was imputed showed a greater beneficial effect from interven-

tion than did those reporting full data. This may have been due to quality differences. Methodologically weaker studies, which may be less likely to report complete data, tend to show larger ESs.[5] Exclusion of trials with imputed values reduced the ES but did not change its direction. Excluding such trials could introduce bias, however. Of 3 trials that reported group means but were excluded from the meta-analysis because SDs could not be imputed, 2[34,35] reported that the intervention had beneficial effects in reducing the outcomes measured, whereas 1[43] reported no effect. Their exclusion may have biased our results toward the null.

Publication bias is an important threat to validity in systematic reviews. Authors may choose not to submit results that are negative or not significant, and journals may not publish such studies.[58,59] Publication bias may also operate within individual studies when investigators selectively report outcomes with "significant" results.[59] We attempted to contact each author to establish whether any unpublished data were available and whether they knew of any further studies, published or unpublished. In addition, we contacted experts and organizations for unpublished studies. Despite such efforts, many trials did not provide data for relevant outcomes known to have been measured, which may have affected these results. The funnel plot suggests that negative studies may exist that were not retrieved and included.

CONCLUSIONS

Violence within our society has been a public concern in recent years. Substantial resources have been allocated to preventing violent injuries and crime. Schoolchildren have been intensively targeted. We identified 44 randomized controlled trials that evaluated school-based programs, of which 28 (64%) provided outcome data. Many trials were small and reported insufficient information to assess quality. Nevertheless, pooled results suggest that these interventions may reduce aggressive and violent behavior and school or agency actions in response to such behavior. However, analysis also suggests the possibility of bias toward studies with positive results and genuine differences among trials, which may mean that the true effect is smaller than that indicated. Larger, better controlled trials, with improved reporting of methods, use of adequate methods for allocation, blinding of outcome assessment, and more complete reporting of results, appear warranted to determine whether the apparent benefit is real. In addition, unexpected results emerged regarding differential effects by sex, which warrant further research.

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What This Study Adds

Each year, 1 in 25 US schoolchildren are victims of violent crime while at school or on the way to and from school. The aggregate effects of the hundreds of school-based youth violence prevention programs currently being implemented have not been adequately evaluated.

School-based violence prevention programs for high-risk children modestly reduced both aggressive behaviors and school or agency actions in response to aggressive behavior. Effects on aggressive behavior were similar regardless of whether the programs focused on training in skills of nonresponse (eg, conflict resolution or anger control) or on training in social skills or social context changes. The benefits of violence prevention programs were similar in programs introduced in both primary and secondary schools, but appeared to be greater among mixed-sex groups. Additional large, well-controlled trials are needed to determine whether the apparent benefits are real.

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