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School-based secondary prevention programmes for preventing violence (Review)

Mytton JA, DiGuseppi C, Gough D, Taylor RS, Logan S

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[Intervention Review]

School-based secondary prevention programmes for preventing violence

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ABSTRACT

Background

Early aggressive behaviour is a risk factor for later violence and criminal behaviour. Despite over 20 years of violence prevention interventions being delivered in the school setting, questions remain regarding the effectiveness of different interventions for children exhibiting aggressive behaviour.

Objectives

To examine the effect of school based violence prevention programmes for children identified as aggressive or at risk of being aggressive.

Search methods

We searched CENTRAL, Cochrane Injuries Group specialised register, MEDLINE, EMBASE, other specialised databases and reference lists of articles. We also contacted authors and organisations to identify any further studies.

Selection criteria

We included trials meeting the following criteria; 1) participants were randomly assigned to intervention and control groups; 2) outcome data were collected concurrently; 3) participants comprised children in mandatory education identified as exhibiting, or at risk of, aggressive behaviour; 4) interventions designed to reduce aggression, violence, bullying, conflict or anger; 5) school based interventions; 6) outcomes included aggressive behaviour, school and agency responses to acts of aggression, or violent injuries.

Data collection and analysis

Data were collected on design, participants, interventions, outcomes and indicators of study quality. Results of any intervention to no intervention were compared immediately post-intervention and at 12 months using meta-analysis where appropriate.

Main results

Of 56 trials identified, none reported data on violent injuries. Aggressive behaviour was significantly reduced in intervention groups compared to no intervention groups immediately post intervention in 34 trials with data, (Standardised Mean Difference (SMD) = -0.41; 95% confidence interval (CI) -0.56 to -0.26). This effect was maintained in the seven studies reporting 12 month follow-up (SMD = -0.40, (95% CI -0.73 to -0.06)). School or agency disciplinary actions in response to aggressive behaviour were reduced in intervention groups for nine trials with data, SMD = -0.48; 95% CI -1.16 to 0.19, although this difference may have been due to chance and was not maintained,

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based on two studies reporting follow-up to two to four months (SMD = 0.03; 95% CI -0.42 to 0.47). Subgroup analyses suggested that interventions designed to improve relationship or social skills may be more effective than interventions designed to teach skills of non-response to provocative situations, but that benefits were similar when delivered to children in primary versus secondary school, and to groups of mixed sex versus boys alone.

Authors' conclusions

School-based secondary prevention programmes to reduce aggressive behaviour appear to produce improvements in behaviour greater than would have been expected by chance. Benefits can be achieved in both primary and secondary school age groups and in both mixed sex groups and boys-only groups. Further research is required to establish whether such programmes reduce the incidence of violent injuries or if the benefits identified can be maintained beyond 12 months.

PLAIN LANGUAGE SUMMARY

Are school-based programmes aimed at children who are considered at risk of aggressive behaviour, effective in reducing violence?

Violence is recognised as a major global public health problem, thus there has been much attention placed on interventions aimed at preventing aggressive and violent behaviour. As aggressive behaviour in childhood is considered to be a risk factor for violence and criminal behaviour in adulthood, violence prevention strategies targeted at children and adolescents, such as school-based programmes, are considered to be promising interventions.

Some school-based prevention programmes target all children attending a school or class, whilst others confine the intervention to those children who have already been identified as exhibiting, or threatening, behaviour considered to be aggressive, such an approach is known as 'secondary prevention'. A wide variety of school-based violence prevention programmes have been implemented over the last 20 years, yet we are still without a full understanding of their effectiveness.

The objective of this systematic review was to determine the effectiveness of school-based secondary prevention programmes to prevent violence (that is those interventions targeted at children identified as aggressive or at risk of being aggressive).

The authors examined all trials investigating the effectiveness of secondary violence prevention programmes targeted at children in mandatory education compared to no intervention or a placebo intervention.

The authors found 56 studies; the overall findings show that school-based secondary prevention programmes aimed at reducing aggressive behaviour do appear to produce improvements in behaviour. The improvements can be achieved in both primary and secondary school age groups and in both mixed sex groups and boy-only groups.

Further research is needed to investigate if the apparent beneficial programmes effects can be realised outside the experimental setting and in settings other than schools. None of the studies collected data on violent injury, so we can not be certain of the extent to which an improvement in behaviour translates to an actual injury reduction. In addition, more research is needed to determine if the beneficial effects can be maintained over time, and if the benefits can be justified against the costs of implementing such programmes.

BACKGROUND

Behaviours that lead to long-term health risks often have their origins in childhood (Grunbaum 2002; Tremblay 2002). Personality differences and behaviours in pre-school children are known to be partially inherited and partially shaped by experience (Jaffee 2005). These early personality types can then be consolidated through childhood experience and linked to risk taking behaviour in adolescence (Caspi 1997). A history of early aggressive behaviour, including antisocial, criminal and bullying behaviour, and low educational attainment are identified as risk factors for later youth and adult violence, and can result in persistent offending behaviour (Krug 2002; Surgeon General 2001). Youth violence erodes social capital, damaging the wider community and leading to the increased likelihood of violence generation (Krug 2002). Worldwide, it has been estimated that during 2000, an average of 565 children and young adults aged 10 to 29 years died every day as a result of interpersonal violence - a rate of 9.2 per 100,000 population per day (Krug 2002). Countless numbers are non-fatally injured or have their social or emotional lives disrupted by the effects of violence. Often the perpetrators of the violent behaviour are the peers of the victims.

Our understanding of the occurrence of violent behaviour by children and adolescents is increasing. Data from the United States' Youth Risk Behavior Surveys (CDC 2004) have been widely reported for 15 years. In a survey of United States high school students, more than a third of respondents reported being in a physical fight in the past 12 months, and 4% were injured seriously enough to require medical treatment (Grunbaum 2002). Other countries are now publishing their own findings, including the Caribbean (Halcon 2003), Iceland (Gudlaugsdottir 2004), and Finland (Mattila 2005). In the United Kingdom the Schools Health Education Unit have surveyed school children since 1977, including questions on bullying and aggression at school (SHEU 2004). The occurrence of carrying weapons to school is an indicator of perceived and real violence occurring on school premises or on the journey to and from school, and an indicator of involvement in aggressive behaviour. Weapon carrying has been shown to be associated with increased risk of fighting and fight-related injury in adolescents (Lowry 1998; Resnick 2004). Of 14 to 15 year olds surveyed in schools across Great Britain in 2004, 25% of boys and 18% of girls reported they were 'fairly sure' or 'certain' that their friends carried weapons (SHEU 2004). Reporting the prevalence of weapon carrying is now specifically published from many countries, e.g. US (CDC 2004), Scotland (McKeganey 2000), New Zealand (McGee 2005), Switzerland (Kuntsche 2004), and Turkey (Ailkasifoglu 2004). The influence of drugs and alcohol on violent behaviour and violence related injuries is becoming more clearly documented. In a nationally representative survey of US secondary school level children, 11% of those admitting to drug and alcohol use, reported fighting whilst under the influence of these substances (Kodjo 2004), similar findings are being reported in other countries e.g. Poland (Mazur 2003).

Since the 1996 World Health Assembly declared violence a major public health problem and called for a science-based approach to violence prevention (Krug 2002), increased attention has been paid to interventions to prevent aggressive and violent behaviour in all age groups. Physical and psychological injuries and their health implications are seen as largely preventable events, and a large number of school-based violence prevention programmes have

been developed. Some have focused on all children attending a school or class (primary prevention), whilst others have confined the intervention to those children who have already been identified as exhibiting or threatening behaviour considered to be aggressive (secondary prevention). With widely publicised school shootings and significant funding opportunities for research, it is perhaps not surprising that many programmes to prevent youth violence originate from the United States of America. However, in 2001, the U.S. Surgeon General's report on Youth Violence, commented that 'hundreds' of violence prevention programmes were being used in American schools without full understanding of their effectiveness (Surgeon General 2001).

It is important that the most effective intervention programmes can be identified. The best evidence for effectiveness comes from the results of randomised controlled trials (Schulz 1995). In the United States a five year randomised controlled trial of both primary and secondary interventions to reduce aggressive behaviour in 11 year olds attending 37 schools across four States, is currently being evaluated. Funded and co-ordinated by the Centers for Disease Control and Prevention, this trial aims to identify whether primary or secondary prevention strategies are effective in developing social, emotional and cognitive skills to handle conflict, using the GREAT (Guiding Responsibility and Expectations for Adolescents for Today and Tomorrow) programme, which includes teacher, student and family intervention components (MVPP 2004). Randomised trials on such a scale are well beyond the scope of many agencies, who may turn to reviews of existing published trails as a source of evidence of effectiveness. A number of reviews have reported on school-based violence prevention programmes in recent years, e.g. Thomas 1999, Wilson 2000, Scheckner 2002, Wilson 2003 and Molina 2005. The ability to generalise the results of these reviews has been limited by their inclusion criteria; for example narrow date restrictions placed on the literature searches, the combined evaluation of primary and secondary prevention interventions and the combined evaluations of randomised controlled trials with non-randomised methodologies. This review therefore aims to address these issues by providing a systematic review of randomised controlled trials of secondary prevention interventions designed to reduce aggressive behaviour in children identified as at risk for such behaviour.

OBJECTIVES

To examine the effect of school-based violence prevention programmes for children identified as aggressive or at risk of being aggressive.

METHODS

Criteria for considering studies for this review

Types of studies

Studies were included if participants were randomly assigned to intervention and control groups, and outcome data were collected concurrently in the two groups. We excluded cluster randomised trials with only two randomised schools or classes, in which confounding factors cannot be effectively eliminated by randomisation.

Types of participants

The study population comprised children in mandatory education (UK years Reception to Year 11, United States Grades K-12, or their international equivalent) identified by author-defined criteria as exhibiting, or at risk of, aggressive behaviour.

Types of interventions

The experimental intervention was designed to reduce aggression, violence, bullying, conflict or anger, or focused on Conduct Disorder or Oppositional Defiant Disorder (when primarily conceived in terms of anger, aggression or violence, as in DSM-III-R or DSM-IV).

Studies with interventions to reduce problem behaviours (e.g. juvenile delinquency, antisocial behaviour, criminal behaviour, conduct problems, externalising behaviour, disruptive behaviour, inappropriate behaviour, adjustment problems) or those promoting positive behaviours (e.g. moral development, social skills, empathy) were excluded unless the authors clearly stated that their aim was the reduction of aggression or violent behaviour.

The intervention was primarily school-based, although it could contain additional components, such as parenting skills training or community interventions. Trials involving school children where the primary intervention took place outside of school were excluded.

Types of outcome measures

Outcome measures included:

- aggressive or violent behaviours as measured by standardised tests (e.g. Achenbach Child Behavior CheckList, Miller School Behavior Checklist) or actual counts of aggressive behaviours like fights or bullying (e.g. via classroom observation, videotapes);
- responses to aggressive or violent behaviours (e.g. school or agency actions, such as detention, suspension, or court contact, recorded in official records, taken in response to aggressive behaviours such as fighting or bullying). When school or agency records did not differentiate between responses to aggressive behaviours and responses to non-aggressive misbehaviours such as truancy, all types of misbehaviours were included;
- violent injuries (e.g. casualty attendances for assault)

Outcomes indirectly related to violence such as school achievement, truancy, knowledge about or attitudes towards violence, measures of aggressive responses to artificial stimuli or experimental tasks, and mental health outcomes (e.g. depression or conduct disorder) were not reported in this review.

For studies with multiple outcome measures, one "A" and one "B" outcome were chosen based on a predefined hierarchy of factors (see Methods of the review).

Search methods for identification of studies

The searches were first conducted in 1998/99 and then updated in 2001. In May 2003 searching of a further three databases was undertaken.

The searches were not restricted by language or publication status.

Electronic searches

We searched the following electronic databases:

- Cochrane Central Register of Controlled Trials (*The Cochrane Library* issue 2, 2001)
- Cochrane Injuries Group specialised register (to May 2003)
- MEDLINE (1966 to August 2001)
- EMBASE (1980 to August 2001)
- National Research Register (issue 2, 2003)
- PsycLIT (1887 to March 1998)
- PsycINFO (1998 to August 2001)
- ERIC (Educational Resource Information Centre) (1970 to August 2001)
- CINAHL (Cumulative Index to Nursing and Allied Health Literature) (1982 to August 2001)
- Dissertation Abstracts (1861 to August 2001)
- IBSS (International Bibliography of Social Sciences) (1952 to 1998)
- Social Sciences Index (1998 to August 2001)
- NCJRS (National Criminal Justice Reference Service) (1970 to 2001)
- Social, Psychological, Educational and Criminal Trials Register of the Campbell Collaboration (C2-SPECTR) (to May 2003)

Searching other resources

To identify relevant trials the electronic databases were searched using content and thesaurus terms to explore the concepts of aggressive behaviour, educational environments, and childhood. The searches were based on the MEDLINE strategy presented in [Appendix 1](#), adapted as appropriate to the specifications of each database and combined with the Cochrane Collaboration's highly sensitive search strategy to identify controlled trials.

In addition we searched the bibliographies of published reviews and relevant trials ([Ang 1999](#); [Bennett 2000](#); [Greenberg 2001](#); [Robinson 1999](#); [Samples 1998](#); [Sherman 1998](#); [Stage 1997](#); [Taylor 1999](#); [Wilson 2000](#)) and handsearched the journal *Aggression and Violent Behavior* (Issue 1, 1996 to Issue 3, 1998).

We also contacted relevant international organisations and experts, and attempted to contact the authors of all relevant studies to identify any unpublished or internal reports.

Data collection and analysis

Selection of studies

The references from the electronic database searches were imported into reference management software programmes and screened by JM (1998 searches) and CD (2001 searches). Based on title, abstract and key words, ineligible studies were excluded on topic, design, population, setting, or intervention (if specified in sufficient detail to exclude the possibility of violence prevention). The full texts of the remaining references were reviewed and additional ineligible studies excluded using the same criteria.

Data extraction and management

Two authors (JM and CD) independently extracted data from each eligible study identified during both search periods. We extracted the following data using a piloted paper extraction form:

- verification of study eligibility;
- the number and description of study participants;
- the types of intervention;
- duration of follow-up;
- outcomes evaluated.

To assess study quality, data were extracted on:

- the method of group assignment;
- method of allocation concealment;
- blinding of outcomes assessment;
- loss to follow-up.

Differences found in data extraction were resolved by discussion. A third author (DG) with expertise in educational interventions and assessment helped to develop a coding strategy for interventions and outcomes and corroborated the information extracted by the first two reviewers by independently extracting data on participants, interventions, and outcomes. Reviewers were not blinded to the names of the journals, the authors, the institutions or the results when extracting data and assessing methods. We attempted to contact all authors of eligible trials to confirm study details, obtain missing data, and identify relevant unpublished outcomes.

Assessment of risk of bias in included studies

The quality of allocation concealment, i.e. the concealment of the study group to which the next enrolled subject was allocated, was assessed because it helps prevent selection bias and protects the assignment sequence. We categorised allocation concealment in three rating groups (Schulz 1995):

- A = adequate, e.g. centralised allocation by an independent person, onsite computer system with allocations in locked unreadable computer file, or sequentially numbered sealed opaque envelopes
- B = unclear or method used could not guarantee concealment, e.g. no report of the concealment procedure, list or table of random numbers, or coin toss
- C = inadequate, i.e. any procedure transparent before allocation, e.g. alternation, use of case record numbers, dates of birth, day of the week, or demonstrated violation of randomisation, implying that allocation was revealed prior to commencement of intervention.

The method of randomisation and the use of blinding were not rated but have been detailed in the tables of included studies. Blinding of participants and providers of care helps prevent performance bias, and blinding of outcome assessors helps to prevent detection bias; hence both were recorded where this information was provided.

Assessment of heterogeneity

Statistical heterogeneity in results is a consequence of either clinical (i.e. participant, intervention or outcome) or methodological (i.e. trial design or quality) diversity amongst the trials in the meta-analysis. Trial heterogeneity was explored with a chi squared test using a significance level of 5%, and the inconsistency statistic, I^2 . The presence of statistical evidence of heterogeneity, suggested a random-effects model was appropriate.

As many studies were of small size but a few were substantially larger, a fixed-effect model was run as a sensitivity analysis, to examine the effect of giving additional weighting to the larger studies.

Assessment of reporting biases

We used a fixed-effect model funnel plot analysis (in which study size is plotted against intervention effect) to examine effects of study size and bias. 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.

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

Trials using cluster randomisation at the level of the class or school were analysed by cluster where this information was available. If unavailable, an intraclass correlation coefficient of 0.15 (CPPRG 1999b) was used to compensate for the reduced within school/class variability that would have reduced corresponding confidence intervals around the effect estimate. As sensitivity analyses we used more extreme values for the intraclass correlation coefficient (i.e. 0.1 and 0.2).

Data synthesis

We compared results of any intervention to no intervention (i.e. control or placebo group) immediately post-intervention, and at 12 months follow-up in the subsample for which these data were collected. Trial participants were analysed in the groups to which they were randomised regardless of the treatment they received, and all randomised participants were included regardless of whether or not their outcomes were actually collected. This intention-to-treat analysis prevented the bias that occurs if randomised individuals are excluded from analyses. Trials with multiple intervention groups and a placebo or control group had intervention group results pooled for the meta-analysis where relevant. If a trial contained a placebo and a control group, the placebo group results were chosen for the meta-analysis in preference to the control group results, in order to estimate the effect of the intervention rather than any effect of attention from the researchers.

We assessed the effect of different types of interventions, grouping them according to the predominant training focus:

- skills of non-response to provocative situations, either managed (e.g., conflict resolution, specific problem solving skills) or not (e.g., anger control, relaxation, stress inoculation);
- relationship skills (e.g. good relationships, prosocial skills, empathy) and other interventions of social context (e.g. family/ social relationships, peer mediation).

We assessed different outcome measures by grouping them into:

- (A) measures of the level or extent of actual aggressive behaviour or physical acts of aggression, either observed or reported;

- (B) school-based or agency responses to acts of physical aggression with or without non-aggressive acts (e.g. disciplinary records, suspensions, court contacts);
- (C) violent injuries.

'A' outcome measures were further subdivided into groups:

- A1 = measures of observed acts of aggressive behaviour, not validated (e.g. tally sheets of observations, or questionnaires asking items such as "How many times did he/you fight this week");
- A2 = quantified measurements of aggressive behaviour (e.g. validated aggression scales such as the Achenbach Child Behaviour Checklist - Teacher Report Form, or questionnaires asking items such as "How often did he/you fight?");
- A3 = measures of aggressive behaviour that were poorly quantified (e.g. questionnaires asking items such as "Does he fight?", or "Have you ever fought?");
- A4 = validated scales of behaviour, that included some aggression items but were not specifically designed to measure aggressive behaviour;
- A5 = measures of mixed responses (e.g. items measuring physical acts of aggression combined with other acts such as vandalism, truancy, or tardiness)

Where more than one 'A' or one 'B' outcome measure was collected by the author, the measure selected for inclusion in meta-analysis was determined by a predefined hierarchy, specifically: Data availability, specificity of the measure for aggressive behaviour, quality of the measure, person completing the measure (where objective or externally rated measures (e.g. teacher completed) were chosen over subjective or internally rated measures (e.g. self report)), completeness of the data, and frequency of that measure being used by other researchers. If two outcome measures existed identical to this point, one was chosen randomly.

Subgroup analysis and investigation of heterogeneity

Subgroup analyses specified a-priori included assessing differences in intervention effects by type of intervention, whether

the program was administered to primary or secondary school students, and boys-only intervention groups versus mixed (or girls-only) groups. "Primary schools" included elementary schools (Grades K-5 or K-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 to 12 or 7 to 12), or students of equivalent ages as above.

Study-specific differences between intervention and control groups for each of these comparisons were pooled using meta-analysis to produce an overall estimate of effect, with 95% confidence intervals. Generic inverse variance (GIV) methods were used since a combination of cluster randomised and non-cluster randomised trials were included. Standardised mean differences (SMDs) of individual trials were calculated using a fixed-effect model analysis, and standard errors calculated from the corresponding 95% confidence intervals, to include in the GIV meta-analysis. In trials with multiple intervention or control groups, weighted, pooled means and standard deviations were used to generate SMDs in order to avoid statistical problems with non-independence 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 reported narratively.

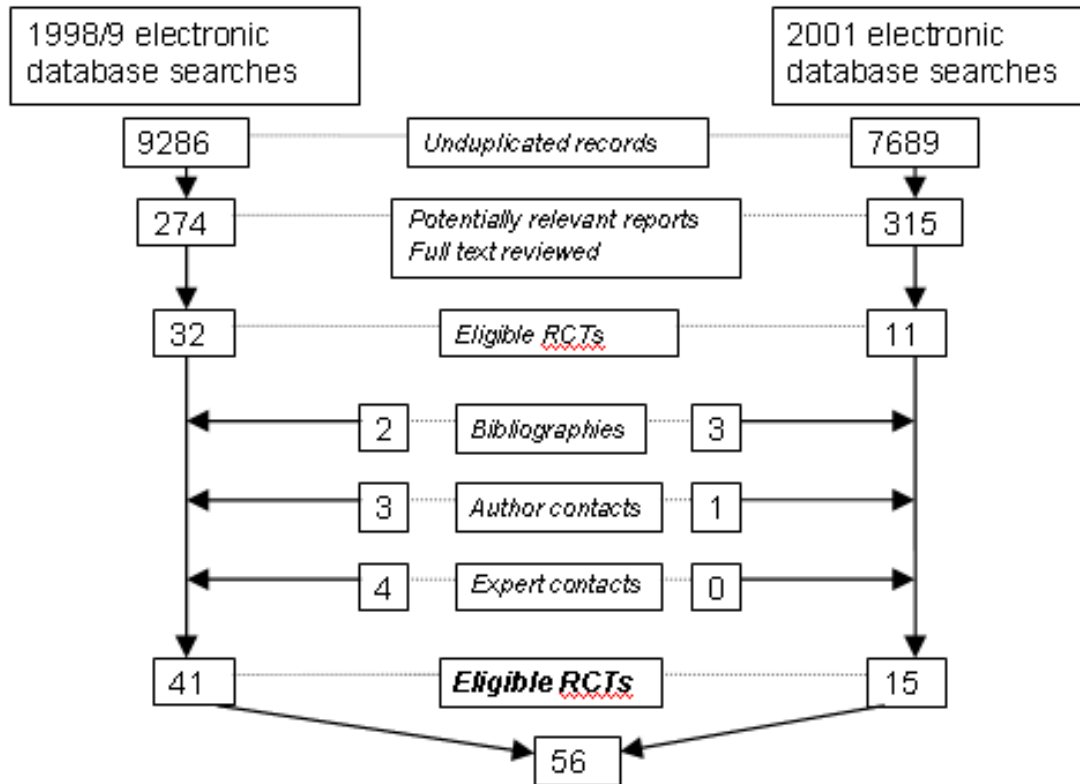
RESULTS

Description of studies

The combined search strategies identified 61 randomised controlled trials of school-based secondary prevention interventions to reduce aggressive behaviour. Preliminary results of the 1998/9 searches were published in 2002 (Mytton 2002). Two RCTs were subsequently determined to be ineligible (Mayer 1983; Miller 1990) and were excluded. Three RCTs (Gottfredson 1986; Gottfredson 1987; Smith1991) identified in the updated searches, were subsequently excluded as focusing primarily on delinquency rather than aggression, leaving 56 eligible RCTs for inclusion (see Figure 1, Additional Figures).

Figure 1. Results of electronic database searches

Results of electronic database searches



Of the 56 RCTs, 51 compared an intervention with a no intervention group (i.e. a control or placebo group). One of these trials was ongoing. Five trials compared two different interventions, of which one was ongoing. Trials comparing two different interventions are not included in meta-analyses.

If the 35 authors who were traceable and contactable, 11 provided additional data, further information on methodology or additional trials (Camp 1977; Cavell 2000; CPPRG 1999; Hudley 1993; Ison 2001; Jones 1991; Lazerson 1980; Meyer 1995; Prinz 1994; Teglas 2001; Tremblay 1991).

After author contacts, 36 of 56 identified RCTs had data suitable for inclusion in a meta-analysis, two trials were ongoing, and 18 trials had no or inadequate data available. Of 51 RCTs comparing an intervention with a placebo or control group, none reported violent injury outcomes, 34 reported data on aggressive behaviour either by aggression scale score or by observed aggression, and nine reported data on school or agency responses to aggressive acts.

Four trials randomised to intervention or control/placebo groups by cluster (either school or class) rather than individual, and

provided data at the level of the individual (Braswell 1997; CPPRG 1999; Etscheidt 1984; Prinz 1994). These trials were therefore adjusted for clustering.

Risk of bias in included studies

Reporting on the methodology of these trials was generally poor. The methodological quality of the included trials was assessed by the reporting of design and conduct features that are likely to prevent systematic errors or bias.

Of the 56 trials identified, two were ongoing. Of the 54 completed trials, there was almost total absence of reporting of allocation concealment. Twenty-seven trials gave no information regarding method of randomisation and such information could not be obtained from the author. In the remaining 27 trials, partial information was available on method of randomisation, and in six of these it was apparent that randomisation had been breached prior to intervention. In one trial the absence of allocation concealment was detailed through the reporting of randomisation by open list. No other trial reported the method of allocation concealment. Therefore none of the trials were coded A for allocation concealment, 48 were coded B and six were coded C.

Fifty-two trials reported collecting information on a measure of aggressive behaviour that was either an aggression scale score or observed aggression. In 18 trials the outcome was reported to be collected blinded, in 14 unblinded, and in the remaining 20 trials information on blinding was not provided.

An intention-to-treat analysis has been used in this review for all trials except one (Teglasi 2001) where the number randomised was not quoted and an available case analysis was used. The majority of authors used numbers of participants present at post test and follow up in their analyses, rather than number randomised. Loss to follow-up varied considerably between studies; changing schools, moving away from the area and absenteeism on the day of the assessment were the commonest reasons for loss to follow-up.

Due to the generally poor level of reporting of quality indicators of studies, we were unable to conduct meta-regression to explore heterogeneity in results on the basis of methodology.

Effects of interventions

Results from studies with data suitable for meta-analysis

Aggressive or violent behaviours on standardised tests or actual counts of aggressive behaviours such as fights or bullying

Of 51 trials comparing an intervention group with a control or placebo group, 45 reported collecting data on teacher completed validated scales of behaviour that assessed aggression, one trial used a peer report measure and one used a self report measure. Four trials used direct observation of pupils' behaviour to detect aggression. Of the teacher completed behaviour scales the commonest used was the Achenbach Child Behavior Checklist - Teacher Report Form, used by authors in 14 trials.

Data were available on 2939 students enrolled in 34 completed trials that measured aggressive or violent behaviours and were suitable for meta-analysis. Aggressive behaviour was significantly reduced in intervention groups compared to control or placebo groups immediately post intervention (Standardised Mean Difference (SMD) = -0.41; 95% CI -0.56 to -0.26) with significant heterogeneity ($\text{Chi}^2 = 98.84$, $P < 0.00001$, $I^2 = 66.6\%$). The effect was maintained at follow up in the seven studies reporting outcomes to 12 months (SMD = -0.4; 95% CI -0.73 to -0.06) with significant heterogeneity ($\text{Chi}^2 = 21.11$, $P < 0.002$, $I^2 = 71.6\%$).

Seven trials used interventions designed to improve relationship or social skills. Post intervention results were beneficial and the differences between groups were greater than would have been expected by chance (SMD = -0.61; 95% CI -0.87 to -0.35), without significant heterogeneity ($\text{Chi}^2 = 9.81$, $P = 0.13$, $I^2 = 38.8\%$), though this was based on relatively small numbers of pupils ($n = 479$). Eighteen trials (containing 943 students) used interventions designed to teach skills of non-response to provocative situations, either managed or not (e.g. conflict resolution, anger control). Beneficial results were again significant (SMD = -0.39; 95% CI -0.61 to -0.16) but with significant heterogeneity ($\text{Chi}^2 = 44.10$, $P = 0.0003$, $I^2 = 61.5\%$). The remaining seven studies of interventions that combined both skills of non-response and improved relationship skills showed less beneficial, though still significant results (SMD = -0.28; 95% CI -0.55 to -0.01), with moderate heterogeneity ($\text{Chi}^2 = 10.89$, $P = 0.09$, $I^2 = 44.9\%$) ($n = 594$). Two trials of skills of non-response produced follow-up data to 4 months (SMD = -0.53; 95%

CI -0.98 to -0.08) without heterogeneity ($\text{Chi}^2 = 0.24$, $P = 0.62$, $I^2 = 0\%$). Two trials of relationship skills produced follow-up data to 6 months (SMD = -0.43) that could have arisen by chance (95% CI -0.94 to 0.08). Similarly, three trials of combined non-response and relationship skills interventions produced follow-up results to 12 months showing beneficial results (SMD = -0.34) that could have arisen by chance (95% CI -0.93 to 0.26).

School or agency responses to aggressive or violent behaviours

Sixteen trials reported collecting information on the responses of schools or other agencies to aggressive or violent behaviours. The commonest measure was disciplinary referrals (e.g. the pupil being sent to the head teacher for poor classroom behaviour). Other measures ranged from a school fine system to school suspensions to court attendances. Nine of these trials, with 1698 participants, reported data on the effects of school or agency actions as a response to violent or aggressive behaviour that could be combined in a meta-analysis. There was a reduction in school or agency responses that could have arisen by chance (SMD = -0.48; 95% CI -1.16 to 0.19), and was associated with high heterogeneity ($\text{Chi}^2 = 217.55$, $P = 0 < 0.0001$, $I^2 = 96.3\%$). Only two of these trials reported any longer-term follow-up, which indicated minimal effects at two to four months (SMD = 0.03; 95% CI -0.42 to 0.47) ($\text{Chi}^2 = 0.25$, $P = 0.62$, $I^2 = 0\%$).

Five trials reporting interventions to promote skills of non-response, produced small beneficial effects on school or agency actions, but not to a degree beyond chance (SMD = -0.30, 95% CI -0.85 to 0.25). Similar results were produced for two trials reporting interventions designed to promote relationship skills (SMD = -0.28; 95% CI -1.65 to 1.10). A single trial reported results from 480 pupils randomised to receive an intervention combining both skills of non-response and relationship skills and produced strongly beneficial results (SMD = -1.95; 95% CI -2.19 to -1.71).

Violent injuries

None of the trials identified reported collecting information on violent injuries.

Subgroup analyses

Primary school versus secondary school

Of the 34 completed trials reporting data on aggressive or violent behaviours, 22 were set in schools for children of primary school age (up to and including age 11), and 12 were in school for children of secondary school age (from 12 years up to the school leaving age in that country).

Post intervention results on differences in aggression scale scores or observed aggression were largely similar for both age groups (primary schools; SMD = -0.42; 95% CI -0.61 to -0.24, and secondary schools; SMD = -0.41, 95% CI -0.56 to -0.26), with greater heterogeneity in the primary school-based trials ($\text{Chi}^2 = 75.14$, $P < 0.0001$, $I^2 = 72.1\%$) than in the secondary school-based trials ($\text{Chi}^2 = 98.84$, $P = 0.04$, $I^2 = 47.0\%$). Benefits became less certain at follow-up in the five primary schools with data (SMD = -0.36; 95% CI -0.77 to 0.05) but remained significant in the two secondary school trials reporting follow-up data (SMD = -0.40, 95% CI -0.73 to -0.06)

Nine trials reported school or agency responses to aggression post intervention, two of which were in primary schools, and seven were in secondary schools. Neither primary schools (SMD = 0.15, 95% CI

-0.37 to 0.67), nor secondary schools (SMD = -0.69, 95% CI -1.49 to 0.11) showed results greater than could have arisen by chance.

Sex of participants

The majority of pupils selected for entry into trials were boys. Twelve of the 34 trials with data were conducted solely on boys, and 22 were conducted on groups of mixed boys and girls. One trial (Hughes 1992) without data for inclusion in the meta-analysis studied interventions for aggressive girls only.

Post intervention differences in aggression scale scores or observed aggression appeared to be somewhat stronger for mixed sex groups (2234 participants, SMD = -0.45; 95% CI -0.64 to -0.26) than for boys alone (705 participants, SMD = -0.35; 95% CI -0.61 to -0.08), although there is significant overlap in 95% confidence intervals suggesting that apparent differences could be largely due to chance. Both had significant heterogeneity: $\text{Chi}^2 = 67.36$, $P < 0.00001$, $I^2 = 68.8\%$ (for mixed sex groups), and $\text{Chi}^2 = 27.83$, $P = 0.003$, $I^2 = 60.5\%$ (for boys only groups). Benefits became imprecise at follow-up for the two studies of boys alone reporting follow-up data (SMD = -0.38, 95% CI -1.02 to 0.26) and for the five studies of mixed sex groups reporting follow-up data (SMD = -0.44; 95% CI -0.91 to 0.02).

Nine trials reported school or agency responses to aggression for boys only groups (two trials) and mixed sex groups (seven trials) post intervention. Neither boys only groups (SMD = 0.23; 95% CI -0.19 to 0.65), nor mixed sex groups (SMD = -0.70; 95% CI -1.54 to 0.13) showed results greater than could have arisen by chance. Similarly, the only two trials reporting school or agency follow-up data (both in mixed sex groups), showed non-significant results (SMD = 0.03; 95% CI -0.42 to 0.47).

Results from studies not in the meta-analysis

Eighteen trials were identified that did not have data suitable for meta-analysis; 12 of these compared an intervention group or several intervention groups with a placebo or control group and six compared one intervention with another.

The total number of children involved in the 12 trials comparing an intervention with a placebo or control group was 2687. Nine of the trials were small (with $n = 60$), while one was much larger ($n = 2181$) (MACS 2002). Ten of the 12 studies reported a teacher rating of aggressive behaviour at post test. Four of these reported statistically significant differences in favour of the intervention at post test (Feshbach 1979a; Feshbach 1979b; Garrison 1982; Pietrucha 1998), and six reported no overall statistically significant differences (Arbuthnot 1986; Coats 1979; Lazerson 1980; MACS 2002; Petit 1998; Sackles 1981) at post test between intervention and control groups. One study reported observed aggressive behaviour, showing statistically significant improvements as a result of the intervention (Forman 1980), and one study reported a peer rating of aggression at post test which showed a statistically significant benefit between intervention and control groups as a result of the intervention (Bienert 1995). Two studies reported long-term follow-up data, one indicated no statistically significant differences between intervention and control groups at nine month follow-up (Arbuthnot 1986) and the other, which had significant attrition, reported no overall benefits greater than could have occurred by chance in the residual sample that received two extended periods of intervention over four years ($n=291$) (MACS 2002).

Only one of these 12 studies reported collecting information on the number of disciplinary referrals post intervention (Arbuthnot 1986), and this indicated a statistically significant reduction in number of referrals in the intervention group compared to the control group, that was maintained at nine month follow-up.

Of the six studies that compared one intervention to another, two were trials assessing the impact of variable intensity of exposure to an intervention programme (Cavell 2000; Hughes 1992), only one of which reported 'statistically significant' differences between groups at post test. This small study (Hughes 1992) ($n=20$) compared a one day conflict management training for students with a two hour discussion group about conflict management. The difference in teacher ratings of aggressive behaviour for the two groups was statistically significant at post test, in favour of the whole day group. This study was unique in the review in that it was the only study to assess girls only. The remaining four studies compared one intervention with another. Three (Camp 1980; Cavell 2000; Hudley 1998) resulted in no statistically significant differences between groups at post testing, whilst one (Hughes 1993), found that teaching the teachers strategies to deal with conflicts between students was statistically more effective than teaching the students similar strategies directly.

Sensitivity analyses

Five of the trials identified from this review randomised students by clusters (Braswell 1997; Etscheidt 1984; CPPRG 1999; MACS 2002; Prinz 1994). In the four trials with data suitable for inclusion in the meta-analysis (Braswell 1997; CPPRG 1999; Etscheidt 1984; Prinz 1994) none were considered to have adequately adjusted for clustering. The results of these trials were analysed in the meta-analysis using a published intraclass correlation coefficient (ICC) of 0.15 (CPPRG 1999b). As a sensitivity analysis meta-analysis was repeated using values of ICC = 0.1 (SMD = -0.42; 95% CI -0.57 to -0.26) and ICC = 0.2, (SMD = -0.41; 95% CI -0.56 to -0.26), indicating minimal effect on results.

The standard deviation (SD) was imputed for five trials with incomplete reporting, for which the SD could not be obtained from authors (Contreras 1981; Day 1993; Huey 1984; Lochman 1993; Oldfield 1982). Omitting these data from the analysis the effect size was SMD = -0.34 (95% CI -0.48 to -0.19), indicating that a beneficial effect greater than that likely to have occurred by chance persists. The five studies with imputed SDs showed a strong effect (SMD = -1.03; 95% CI -1.40 to -0.66).

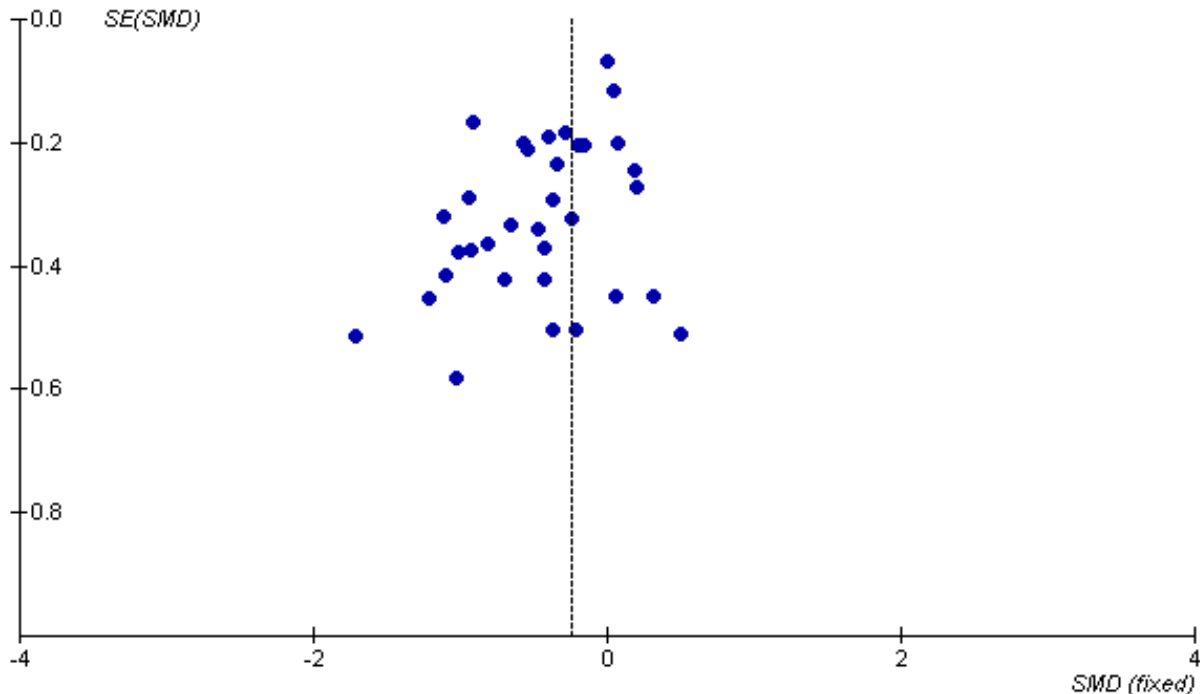
As a sensitivity analysis the Generic Inverse Variance meta-analysis was re-run as a fixed-effect model. The result for 34 trials measuring changes in aggressive or violent behaviour by validated rating scale, or observed aggressive behaviour was SMD = -0.25 (95% CI -0.32 to -0.17), similar to the result generated by the random effects model (SMD = -0.41; 95% CI -0.56 to -0.26).

Funnel plot analysis

The results of a funnel plot analysis to assess publication bias are shown in Additional Figure 2. This shows a spread of studies within an inverted funnel, with an absence of smaller studies with negative results.

Figure 2.

Review: School based violence prevention programmes for children with aggressive behaviour (Version 02)
 Comparison: 01 Any violence prevention intervention vs no intervention (type of school)
 Outcome: 01 Difference in aggression scale score or observed aggression by type of school(post intervention)



DISCUSSION

Principal findings

This review of school-based secondary prevention programmes to reduce aggressive and violent behaviour has found that there is evidence that these programmes are capable of producing moderate beneficial effects, as evidenced by improvements in teacher rated or observed behaviour or reductions in the number of school responses to aggressive behaviour such as referrals to the headteacher. The former of these is a change greater than that which might be expected by chance (pooled effect size on measures of aggressive behaviour or observed behaviour was -0.41; 95% CI -0.56 to -0.26). The difficulty arises in interpreting these findings in real terms. The meta-analysis has used a standardised mean difference between groups to pool the studies, that is, has considered the different methods of assessment as though they were one standardised method. It is therefore not easy to translate this figure back to the original measure to determine the apparent reduction in aggression. Meta-analyses of interventions to reduce criminality have had to address the same issue. Here, the effect size may be converted into the fraction of people who re-offend (Farrington 2002). Applying a similar method to our findings, we could consider that if the percentage of children in a control group who demonstrate aggressive behaviour is 50%, an effect size of -0.41 would mean that only 30% would demonstrate aggressive behaviour in the intervention group. Similarly, if 50% of children in a control group were referred to the head teacher for aggressive classroom behaviour, then only 26% would be referred in the intervention groups according to the findings of our meta-analysis.

We did not find any evidence of the effect of school-based violence prevention interventions on injuries resulting from aggressive behaviour. The association between aggressive or externalising behaviour and injury has been demonstrated in longitudinal cohort studies from different countries including New Zealand (Langley 1983), and Great Britain (Bijur 1986). This strengthens the rationale for the use of aggressive behaviour as a proxy measure for injury.

We have shown that interventions designed to improve relationship or social skills, and interventions designed to teach non-response to provocative situations, are both capable of producing benefits greater than would have been expected by chance, when delivered independently or in a combined intervention. Interventions designed to improve relationship or social skills appear to be the most beneficial. The type of intervention components delivered, either to individuals or groups, during relationship or social skills training included how to develop good relationships and get on with others by such skills as listening, learning to respond positively to the feelings of yourself and others, understanding how your own behaviour affects the way that other people relate to you, how to work cooperatively with others, or how to assert yourself in a constructive manner. Some of these interventions were combined with interventions in the school environment (e.g. school-wide activities to promote consideration of others) or in the home environment (e.g. family counselling).

The intervention benefits described may persist to 12 months post intervention, but there is little evidence evaluating whether they can be maintained beyond this period. Two of the trials in this review reported follow-up beyond 12 months. The study

by Tremblay was followed up at three years post intervention (Vitaro 1994) using a teacher reported aggressiveness scale, which indicated significantly lower aggressiveness in the treatment group than the control group ($P < 0.05$) at age 12 years (placebo group not reported), suggesting that beneficial effects may be retained. However, a two year follow-up of the study by Barkley (Shelton 2000) reported no significant difference between treatment and control groups for teacher ratings of aggressiveness on the Achenbach Child Behaviour Checklist. These results need to be interpreted with caution as treatment groups were collapsed for this later analysis, and intention to treat was not used.

Interventions delivered in the primary and secondary school setting both showed reductions in aggression as assessed by aggression scale scores or observed aggression at post test, and these reductions appeared to be maintained at follow-up. It is encouraging that despite necessary differences in mode of delivery, these interventions appear beneficial to aggressive children of all ages. This analysis would suggest that it would be inappropriate to focus all preventive attention solely on younger age groups.

Although most programmes focussed either solely or largely on boys, programme effects on aggressive behaviour appeared to be similar among mixed sex groups and boys only groups.

Methodological issues arising in the review

Study quality

The trials included in this review varied considerably in their selection of students, type and duration of intervention, measurement of outcomes, and follow-up. The reporting of the methodology and quality indicators was generally poor, limiting the assessment of study validity. Despite our attempts to contact all authors, much information remained unavailable, particularly relating to allocation concealment, method of randomisation, use of blinding and loss to follow-up.

Allocation concealment and blinding

Allocation concealment reduces the chance of producing an error in the estimate of effect through allocation bias (Schulz 1995). In 14 studies randomisation was reported to be achieved by using a table of random numbers, but in only three of these was this stated to be computer generated. Only one trial in this study reported sufficient information to judge allocation concealment (i.e. the table of random numbers was stated to be an 'open list'). The absence of such information threatens our ability to assess the internal validity of the individual trials. Whilst it may not have been possible to conceal their allocation group from pupils, classes or schools (i.e. 'blinding'), 14 studies also failed to blind those who assessed outcomes. This failure risks biased reporting of intervention effects, specifically the overestimation of beneficial effects. In a further 20 studies the use of blinding was unclear, though it can be anticipated that a number of these studies also failed to blind assessors.

Cluster randomisation

In cluster randomised trials groups of students are randomised to intervention or control conditions determined by pre-existing groupings, in these cases clusters were either schools or classes. Individuals within clusters tend to be more similar than individuals between clusters and this similarity needs to be taken into consideration in analysis. Failure to do so would result in more weight being given to some studies than would be appropriate,

and would spuriously narrow the 95% confidence intervals. To avoid unit of analysis errors adjustments should be made by authors to account for the clustering. In the four trials with data suitable for inclusion in the meta-analysis (Braswell 1997; CPPRG 1999; Etscheidt 1984; Prinz 1994) none were considered to have adequately adjusted for clustering. Although we adjusted these results in the meta-analysis by incorporating an intraclass correlation coefficient taken from published literature and found similar results for a range of ICCs, our results might nevertheless have differed had the true ICCs from these studies been available, or had cluster-adjusted results been provided by the authors. In the fifth cluster randomised trial (MACS 2002), the information available was insufficient for us to identify and adjust appropriate values for inclusion in the meta-analysis without making assumptions about which we could not be confident. This study was therefore reported narratively.

Effect of imputing standard deviations

We found substantial differences between studies that reported standard deviations, and those for which the SD has to be imputed. The difference in SMD between the studies where the SD was imputed and those where it was published may have been due to quality differences. Methodologically weaker studies, which may be less likely to report complete data, tend to show larger effect sizes (Schulz 1995). Excluding trials where the SD was imputed tended to reduce the overall effect size but did not change its direction.

Heterogeneity of results

The tests for heterogeneity indicated wide variations in effects of studies. An important cause of heterogeneity is baseline risk varying between studies. Baseline risk represents a combination of known and unknown risk factors. As the studies in this review included aggressive students identified as aggressive by author defined criteria they varied in their level of high-risk status. Because of inadequate reporting on these processes for many trials, and difficulty in establishing population rates for service actions on which the selections were based (e.g. referrals to the head teacher for aggressive behaviour), we could not explore whether programme effectiveness varied according to how aggressive the children were at selection. Investigating this relationship is complicated by regression to the mean, since the control group risk forms an integral part of the effect estimate.

Publication bias

We used a funnel plot to indicate publication bias in our meta-analysis. 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 publication bias, i.e. that some studies or study data exist that may not have been published or located. But asymmetry can also be explained by the poor methodological quality of smaller studies (which tend to show larger effect sizes) or true heterogeneity in the results, such as differences in baseline variables between studies, study quality and duration and intensity of the interventions. We found that age, sex and type of intervention all contributed to the heterogeneity identified but did not fully explain it. Studies included in this review varied substantially with respect to their reporting of study quality (e.g. allocation concealment, method of randomisation and use of blinding), and reporting of these variables was so poor that exploration of heterogeneity by meta-

regression was not possible. We identified 18 trials that were not suitable for inclusion in our meta-analysis, 12 of which would have been included had data been available. Absence of these data may have influenced our findings.

Unpublished studies tend to be smaller in size and therefore less powerful, but may be less prone to issues such as publication bias. Conversely, published studies are often larger, and more powerful, but by virtue of being published are prone to publication bias, therefore a sensitivity analysis was done for both published and unpublished studies. Of the 34 studies with data suitable for inclusion in the meta-analysis, four (Braswell 1997; CPPRG 1999; Harris 1992; Walker 1998) were identified initially by author or expert contact, although all have subsequently had reports with data published. We therefore did not identify any data that was from unpublished work.

Choice of method of analysis

An intention-to-treat analysis was used in the meta-analysis in all but one study (Teglasi 2001), where the number randomised was not reported, and an available case analysis was used.

Most of the trials included in the meta-analysis comparing any violence prevention intervention to no intervention were small (22 out of 34 trials included less than 60 participants). Therefore, although randomised, differences in the baseline characteristics between pretest scores could have arisen by chance. Differences between pretest and posttest scores were not available for the majority of studies (20 out of 34 trials reported results only on those children available at post test). Therefore the post test scores were used, adjusted for pretest differences where this information was reported.

Our subgroup analyses were specified a priori, and therefore these observational findings are eligible to contribute to the conclusions of the review. Ideally, subgroups should contain >10 studies (Alderson 2004), which was the case for our analyses of primary school versus secondary school interventions and for analyses comparing boys only groups with mixed sex groups. However, our analysis relating to type of intervention produced three groups; skills of non-response, relationship / social skills and interventions that combined both non-response skills and relationship / social skills. The latter two of these groups resulted in analyses run on seven studies each. We believe that the differences between subgroups identified in this review are of practical importance as they suggest the most effective type and setting of interventions for aggressive children. We sought evidence to support our meta-analysis findings on type of intervention, in the six studies that compared one intervention to another (and were therefore unsuitable for inclusion in the meta-analysis). None of these six studies compared an intervention of relationship / social skills with one of teaching skills of non-response. However, one study (Cavell 2000) compared an enhanced mentoring programme (which combined teaching problem solving skills with family and mentoring work) with a standard mentoring programme. This study assessed teacher rated aggressive behaviour and indicated no significant difference between the groups ratings at either post test or follow-up, though both groups reduced their rating of aggression with time.

Generic inverse variance methods of meta-analysis were used in this review. The GIV meta-analysis was run as a random-effects

model to account for the heterogeneity between studies, indicating the average treatment effect. However, the majority of the studies included in the meta-analysis were relatively small (22 of the 34 trials with data involved 60 participants or less), save for two trials (Braswell 1997; CPPRG 1999) where the numbers of participants were 309 and 891, respectively. It could be argued that a random effects model that weights studies more or less equally is inappropriate in these circumstances, and that these two trials could justifiably be weighted more heavily. Therefore as a sensitivity analysis the GIV meta-analysis was re-run as a fixed-effect model. The results were similar to the results generated by the random effects model, suggesting that a random-effects model was an appropriate method of analysis considering the degree of heterogeneity reported.

Interpretive issues arising in this review

The usefulness of a systematic review depends upon the ability of its inclusion criteria to apply to populations of local interest. In selecting the participants of this review we sought to include children of all ages within the mandatory education system of their country, in order to be relevant to as wide an audience as possible. It should be acknowledged that the majority of these trials were based in the United States of America. Of 51 identified RCTs, one was from Australia (Jones 1991), two were from Argentina (Ison 1997; Ison 2001), five were from Canada (Bienert 1995; Day 1993; Lee 1979; Pepler 1995; Tremblay 1991) and the remaining 43 were from the US.

As stated, trials varied considerably in their selection processes for identifying children demonstrating aggressive behaviour, and the duration and intensity of the interventions applied also varied widely, from a single two-hour discussion group on conflict resolution (Hughes 1992) to over 53 hours of intervention spread over two years (MACS 2002). Therefore the reporting of studies with such variety of participants and interventions was very important. Unfortunately reporting of study design and quality was generally poor, and attempts to contact all authors did not wholly rectify this problem. Inclusion criteria were strictly adhered to and judgements and assumptions minimised, preferring to exclude studies if doubts persisted about eligibility criteria. Despite this, the variability of studies is reflected in the statistical heterogeneity identified through meta-analysis.

In producing this review we have sought to be comprehensive in our reporting and transparent in our methodology, in an attempt to provide an unbiased review of the evidence available. Yet we must acknowledge that in this review, as in any review, methodological decisions made along the way by us as reviewers have been based on our judgements and opinions, and are therefore not immune to comment or criticism. In addition, the findings of this review need to be considered in the context of secondary prevention interventions in non-school settings, effective primary prevention interventions to reduce violence, and the changing social contexts and experiences of children and adolescents.

AUTHORS' CONCLUSIONS

Implications for practice

School-based interventions targeted to children exhibiting aggressive or violent behaviours are beneficial in reducing both reported or observed aggressive behaviour and school responses

to aggression, such as referrals to the headteacher. Interventions designed to improve relationship skills or social skills may be more effective than interventions designed to teach skills of non-response to provocative situations. Primary or secondary school settings are capable of producing beneficial results with these interventions, and these results do not therefore support the premise that interventions to address aggressive behaviour have to be commenced at as early an age as possible. Interventions can be beneficial when delivered to either mixed sex or boys alone groups.

Implications for research

This review has provided evidence that school-based secondary prevention programmes are effective in reducing aggressive behaviour. To utilise this knowledge, questions that now need to be addressed include whether the beneficial effects can be maintained outside an experimental intervention setting, whether the beneficial effects can be replicated in contexts other than standard school settings (such as special school provision or youth detention facilities), and whether they can be replicated in countries other than those where the research was conducted. This review has highlighted areas where existing research either has not been identified or where available evidence is inconclusive.

The review was not able to identify any evidence of the effect of school-based programmes to reduce the occurrence of aggression-related injury. Also, it has not been possible to establish whether the effects of these interventions can be sustained in the long term (greater than 12 months), or whether there are specific components of the interventions that result in more beneficial outcomes than others. The cost effectiveness of such interventions needs to be established before widespread dissemination of programmes should be considered. These issues are all areas for further primary research.

The poor reporting of studies we encountered limited our ability to adequately assess study quality. We would encourage the use of guidelines and standards of reporting (such as CONSORT) in all new randomised controlled trials of such interventions to facilitate the assessment of study validity in the future.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Arbuthnot 1986

Methods	Rank ordered for severity of problems, matched in pairs, Pairs allocated by coin toss.
Participants	48 grade 7-10 students, teacher nominated on basis of behaviour.
Interventions	I: Moral dilemma discussion group (45 minutes per week for 16-20 weeks) C: No intervention.
Outcomes	(1) Moral judgement interview (2) *School adjustment index , teacher (blinding unclear) (3) *Disciplinary referrals (4) Frequency of police or court contacts (5) School absenteeism or tardiness (6) School grades.
Notes	Post testing data collection during the last 2 months of intervention and following 1 month. Follow up data collection during the 9 month school year following the intervention.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Barkley 2000

Methods	Matched for gender, then randomised. Method of randomisation unspecified. Randomisation violated in 8 cases.
Participants	158 Kindergarten children (aged 4.5 to 6 years) parent rated as being aggressive, impulsive and disruptive.
Interventions	I1: Parent only training (PT) (1 sessions per week for 10 weeks + 2 booster sessions) I2: Special Treatment Classroom (STC) I3: PT & STC C: No Intervention.
Outcomes	Parent ratings (1) CBCL (2) Home situations questionnaire (3) Normative adaptive behavior checklist. Teacher ratings: (4) *CBCL-TRF (unblinded) (5) School situations questionnaire (6) Self-control rating scale (7) Social skills rating scale. (8) Clinic behavioural observations (9) Classroom observed behaviour.
Notes	Data collection post treatment and at 2 years.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Bienert 1995

Methods	Randomisation by computer generated table of random numbers.
Participants	78 grade 6 students scoring ≤ 1 SD below mean for Peer Likeability Scale and identified as aggressive-disruptive or sensitive- isolated on the Minnesota Revised Class Play.
Interventions	I: Deficit specific social skills training (60 minutes per week for 10 weeks). C: no intervention.
Outcomes	(1) Peer rating of likeability scale (2) *Minnesota revised class play (blinding unclear) (3) Perceived self confidence scale (4) Teacher skills checklist.
Notes	Data collection at 0 and 6 months.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Bierman 1987

Methods	Randomisation unspecified.
Participants	32 boys in grades 1-3 peer nominated for negative behaviour.
Interventions	I1: Social skills training with reward reinforcement (10 x 30 minute sessions) I2: Rule giving and reward reinforcement (10 x 30 minute sessions) I3: I1 + I2 (10 x 30 minute sessions) C: No intervention

Bierman 1987 (Continued)

Outcomes (1) *Behavioural observations (independent observers) (blinded) (2) Pupil Evaluation inventory (Peers & teachers) (3) Conners abbreviated teachers rating scale (4) Sociometric scale (Peers)

Notes Data collection at 0 and 6 weeks.

Risk of bias

Bias	Authors' judgement	Support for judgement
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Allocation concealment?	Unclear risk	B - Unclear
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Booth 1995

Methods Randomisation unspecified.

Participants 53 grade 6-8 students with repeated principal referrals and suspensions for aggressive behaviour.

Interventions I: Group anger control training. (12 x 45 minute sessions). C: Usual school services (access to counseling and referral if required)

Outcomes (1) *Achenbach Child Behavior Checklist (CBCL) - Teacher Report Form (TRF) (unblinded) (2) Youth Self Report Form (3) *Disciplinary referrals (4) Student Evaluation Inventory.

Notes Data collected at 1 week and 4 months.

Risk of bias

Bias	Authors' judgement	Support for judgement
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Allocation concealment?	Unclear risk	B - Unclear
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Boswell 1983

Methods Randomisation unspecified. 4 boys put in intervention group on request of school counsellor.

Participants 62 grade 3-6 boys referred by teacher to school counsellor due to anger control problems.

Interventions I1: Anger management training. (2 session per week for 5 weeks, or 1 session per week for 10 weeks) I2: Stress inoculation training. C: No intervention

Outcomes (1) *Miller School Behavior Checklist , teacher (blinded) (2) Imaginal & Role Play anger provoking situations (3) Rosenweig Picture Frustration Study

Notes Timing of data collection unclear.

Risk of bias

Bias	Authors' judgement	Support for judgement
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Allocation concealment?	High risk	C - Inadequate
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Braswell 1997

Methods	Cluster randomisation of matched school districts. Method of randomisation unspecified.
Participants	309 grade 1-4 students scored as >1.75SD above norm on the Conners Hyperactivity Index.
Interventions	I1: Minnesota Competence Enhancement Intervention. Children taught social skills, anger management & conflict resolution (18 x 45 minute session in year 1 , 10 sessions in year 2) + Parent training (9 x 120 minute sessions in year 1 & 6 sessions in year 2) + Teacher training (2 x 120 + 9 x 45 minute sessions in year 1 & 1 x 120 + 5 x 45 minute sessions in year 2). C: No intervention for children. Teachers and parents had information sharing sessions.
Outcomes	(1) *Behavioural Assessment System for Children (BASC) - Externalising problems -Teacher form (blinding unclear) (2) BASC - Externalising problems - Parent form (3) Self Report of Personality Scale (4) Conners Teacher Rating Scale - hyperactivity index (5) Problem Solving Rating Scale (PSRS) - Teachers form (6) PSRS - Parents form (7) Structured Behavioural Observations
Notes	Data collected immediately and at 12 months. Published data adjusted for cluster randomisation.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Camp 1977

Methods	Randomisation by drawing names from a bag
Participants	23 grade 2 boys scored by teacher as ≥ 2 SD above norm on aggressive subscale of Miller School Behavior Checklist
Interventions	I1: Think Aloud program to improve self control. (1 x 30 minute session daily for 6 weeks) C: No intervention
Outcomes	(1) *Miller School Behavior Checklist - aggressive subscale, teacher (unblinded)
Notes	Data collected up to 3 weeks

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Camp 1980

Methods	Randomisation by coin toss
Participants	63 grade 1-2 boys scored by teachers ≥ 65 on aggressive subscale of School Behavior Checklist
Interventions	I1: Think Aloud program + delayed refresher program (1 x 30 minute session daily for 8 weeks + 3 sessions per week for 1 month) I2: Great Expectations program + refresher program.

Camp 1980 (Continued)

Outcomes	(1) Observed classroom behaviour (2) *Miller School Behavior Checklist , teacher (blinded)	
Notes	Data collected immediately after intervention and refresher program	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Cavell 2000

Methods	Randomisation unspecified, but participants blocked by grade	
Participants	62 grade 2-3 students, teacher nominated & scoring ≥ 84 th centile on CBCL - aggression subscale	
Interventions	I1: Therapeutic mentoring + parent & teacher consultation (weekly contact for 16 months) + problem solving skills training (2 x 30 minute sessions per week for 23 weeks) I2: Standard mentoring (Minimum of 1 hour per week for 16 months)	
Outcomes	(1) CBCL - parent form (2) *CBCL-TRF aggression subscale (blinding unclear) (3) Peer rated aggression	
Notes	Data collected at end of intervention and 1 year follow up	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Coats 1979

Methods	Randomisation unspecified	
Participants	16 grade 3 boys selected on observation and teacher nominated for aggression, impulsivity and poor self control	
Interventions	I: Cognitive self instruction training (4 x 30 minutes per week for 2 weeks) P: attention control group, no intervention (4 x 30 minutes per week for 2 weeks)	
Outcomes	(1) Classroom behavioural observation scale (2) Conners Behavioural Rating scale - aggression and hyperactivity subscales, teacher (unblinded) (3) Staged problematic situation test	
Notes	Data collected immediately post intervention	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Contreras 1981

Methods	Randomisation by computer generated table of random numbers.
Participants	22 senior high school students previously suspended for aggressive behaviours (11/22 in Special Education, of whom 8 intellectually disabled).
Interventions	I1: Structured life skills program (2 x 60 minute sessions per week for 5 weeks). P: Discussion group of song lyrics. C: No intervention
Outcomes	(1) *Videotape recordings of physical aggression (Independent observers) (blinding unclear)(2) *school suspensions, from school records
Notes	Data collected during last session and at one week.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Coons 1996

Methods	Randomisation unspecified.
Participants	95 students aged 12 to 17 randomly selected from a pool displaying at least 3 of: verbal & physical aggression, failing grades, family turmoil, conduct disorder diagnosis and record of arrest.
Interventions	I: Shame reduction group therapy (60 minutes per week for 10 wks) C: no intervention
Outcomes	(1) Internalised shame scale (2) State-triat Anger Expression Inventory (a) trait anger subscale (b) *Outwardly expressed anger subscale, self report (unblinded)
Notes	Data collection unspecified.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

CPPRG 1999

Methods	Coin toss of matched pairs. Cluster randomisation by school.
Participants	891 grade 1 students (~48 schools) scoring highest 10% on Teacher Observation of Classroom Adaptation - Revised (TOCA-R), and a parent report including the CBCL aggression scale.
Interventions	I: Fast Tract PATHS Curriculum (Promoting Alternative Thinking Strategies) + parent groups + home visiting + academic tutoring. C: No intervention
Outcomes	(1) CBCL - externalising subscale (parent) (2) Parent Daily Report (3) Parent Ratings of Child Behavior Change (4) *CBCL-TRF (blinding unclear) (5) TOCA-R (6) Authority Acceptance Scale (teacher) (7) Teacher Ratings of Child Behavior Change (8) Peer nominations of aggressive behavior (9) School ob-

School-based secondary prevention programmes for preventing violence (Review)

CPPRG 1999 (Continued)

servations of aggressive behavior (10) TOCA-R (observer) (11) *School records of special education use (12) Home behavior (observer)

Notes Data collected at end of intervention.

Risk of bias

Bias	Authors' judgement	Support for judgement
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Allocation concealment?	Unclear risk	B - Unclear
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D'Elia 1982

Methods Randomisation by table of random numbers: open list.

Participants 480 grade 7-9 students who in previous year were truant >15 days + referred to Dean >4 times for aggressive or destructive behaviour + suspended from school >2 times for criminal activity or serious aggressive or destructive activity

Interventions I1: Individual conflict management training (2 x 45 minute sessions per week for 9 months). I2: Family mediation. I3: Peer group conflict management training. C: No intervention

Outcomes (1) *Disciplinary referrals (2) School suspensions

Notes Data collected at one month.

Risk of bias

Bias	Authors' judgement	Support for judgement
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Allocation concealment?	High risk	C - Inadequate
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Dauer 1994

Methods Randomisation unspecified.

Participants 98 grade 6-7 boys nominated by school principal for conduct problems & disciplinary referrals for anger management problems.

Interventions I: Anger management program (1 x 40 minute session per week for 8 weeks). C: No intervention

Outcomes (1) *Conners Teacher Rating Scale 39 - conduct problem subscale, teacher (blinded) (2) State-Trait Anger Expression Inventory (Ax-O subscale) (3) *Disciplinary referrals

Notes Data collected at end of intervention.

Risk of bias

Bias	Authors' judgement	Support for judgement
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Allocation concealment?	Unclear risk	B - Unclear
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Day 1993

Methods	Randomisation by coin toss of matched pairs.
Participants	32 6-12 year old students, teacher nominated and scoring ≥ 60 on CBCL-TRF (externalising subscale).
Interventions	I: Group cognitive skills training (2 x 75 minutes per week for 12 weeks) + Individual coaching (1 x 30 minute session per week for 12 weeks) + Family outreach. School wide social skills training. C: School wide social skills training only
Outcomes	(1) *CBCL-TRF (unblinded) (2) Olweus Bullying Survey (3) Observed classroom aggression (4) Self report aggression questionnaire
Notes	Data collected at end of intervention.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Deffenbacher 1996

Methods	Randomisation by table of random numbers.
Participants	124 grade 6-8 students scoring ≥ 75 th centile on Spielberger Trait Anger Scale.
Interventions	I1: Cognitive relaxation & coping skills training (9 x 45 minute sessions) I2: Social skills training (9 x 45 minute sessions) C: No intervention
Outcomes	(1) Anger Expression Inventory (Ax-O subscale) (2i) Deviant behavior rating scale (2ii) *School Deviance Score, self (unblinded)
Notes	Data collected at 8 weeks.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Etscheidt 1984

Methods	Cluster randomisation by drawing names from a hat.
Participants	30 grade 6-12 students from school for chronically disruptive students.
Interventions	I1: Anger control program (12 x 30-40 minute sessions over 3 weeks) I2: Anger control program with behavioural reinforcement C: No intervention
Outcomes	(1) Self Control Rating Scale (2) *Classroom observations of aggression (Independent observer) (blinded) (3) *School behavior records (teacher) (blinding unclear) Checklist

Etscheidt 1984 (Continued)

Notes Data collected at 3 weeks & 7 weeks.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Feindler 1984

Methods	Randomisation unspecified.
Participants	36 students aged 12-15 attending an in-school behaviour modification program for children with >=2 suspensions in previous year for offences other than smoking or truancy.
Interventions	I: Anger control training (2 x 50 minute sessions per week spread over 7 weeks for total of 10 sessions) C: No intervention
Outcomes	(1) *Self control rating scale (inverse mean used) (teacher) (blinded) (2i) School suspensions (2ii) *School fines
Notes	Data collected at 5 weeks.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Feshbach 1979a

Methods	Randomisation by table of random numbers.
Participants	60 grade 3-5 students nominated by teacher ratings of aggressive behaviour.
Interventions	I1: Empathy training (cognitive and behavioural) (3 x 60 minute sessions per week for 10 weeks) I2: Empathy training (cognitive only) (180 minutes for 10 weeks) P: Problem solving skills training (90 minutes per week for 10 weeks) C: No intervention
Outcomes	(1) Ratings of aggressive behaviour, teacher (blinding unclear) (2) Classroom observation
Notes	Data collection unclear.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Feshbach 1979b

Methods	Randomisation by table of random numbers.
Participants	98 grade 3-4 students teacher and peer nominated on ratings of social behaviour.
Interventions	I1: Empathy training (cognitive and affective) (90 minutes per week for 10 weeks) P: Problem solving skills training (90 minutes per week for 10 weeks) C: No intervention
Outcomes	Ratings of aggressive behaviour, teacher (blinding unclear).
Notes	Data collected at 0 and 6 months.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Forman 1980

Methods	Randomisation unspecified.
Participants	20 grade 3-5 students referred to school psychologist for aggressive behaviour.
Interventions	I1: Cognitive restructuring group (2 x 30 minute sessions per week for 6 weeks) I2: Response cost program (60 minutes per week for 6 weeks) P: Reading tutoring sessions
Outcomes	(1) *Classroom observations, teacher (unblinded) (2) Devereaux Elementary School Behaviour Rating Scale
Notes	Data collected during last week of intervention.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Garrison 1982

Methods	Randomisation unspecified.
Participants	30 grade 3-5 boys with highest teacher ratings on CBCL anger scale, not already receiving psychological services or remedial education.
Interventions	I: Affective imagery training (3 x 30-40 minute sessions over 1 week) P: Attention group (35 minute sessions for 3 sessions) C: No intervention
Outcomes	(1) *Behaviour checklist - arguing subscale, teacher (blinded)
Notes	Data collected post intervention.

Risk of bias
School-based secondary prevention programmes for preventing violence (Review)

Garrison 1982 *(Continued)*

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Gilberg 1982

Methods	Randomisation unspecified.
Participants	30 grade 7-12 boys identified by teacher and school counsellor as aggressive.
Interventions	I: Cognitive role taking training (1 x 60 minute session per week for 8 weeks) P: Story telling (60 minutes per week for 8 weeks) C: No intervention
Outcomes	(1) *CBCL-TRF (blinded) (2) Classroom observation
Notes	Data collected at 2 weeks.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Harris 1992

Methods	Randomisation unspecified. No more than 2 students in each class were assigned to the experimental condition.
Participants	67 grade 1-2 students scoring >70th centile on CBCL-TRF
Interventions	I1: Psychology consultants worked with teachers to provide behavioural strategies (12 weeks) C: No intervention
Outcomes	(1) *CBCL-TRF (blinded)
Notes	Data collected immediately.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hudley 1993

Methods	Randomisation by table of random numbers.
Participants	72 grade 3-5 boys nominated by peers and teachers as aggressive.

Hudley 1993 (Continued)

Interventions	I: Attributional retraining (2 sessions per week for 6 weeks) P: Thinking skills attention control group (2 sessions per week for 6 weeks) C: No intervention	
Outcomes	(1) *Teacher checklist - total aggression subscale (blinded) (2) *Disciplinary referrals	
Notes	Data collected immediately (outcome 1) and at 3 months (outcome 2).	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hudley 1998

Methods	Randomisation by table of random numbers.	
Participants	384 grade 3-6 boys nominated by peers and teachers as aggressive.	
Interventions	I: Attributional retraining (2 x 60 minute sessions per week for 6 weeks) P: Problem solving skills and critical thinking attention control group (120 minutes per week for 6 weeks) C: No intervention	
Outcomes	(1) *Disciplinary referrals (2) *Social Skills Rating System - Teacher form (blinded)	
Notes	Data collected immediately and at 6 and 12 months.	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Huey 1984

Methods	Randomisation by table of random numbers.	
Participants	48 grade 8-9 boys referred to the school administrator for chronic classroom disruption.	
Interventions	I1: Assertion training (Counselor led) (2 x 60 minute sessions per week for 4 weeks) I2: Assertion training (Peer led) (same duration) P1: Discussion group (Counselor led) (2 x 60 minute sessions per week for 4 weeks) P2: Discussion group (Peer led) (same duration) C: No intervention	
Outcomes	(1) Behaviour Role Play test (2) Hand Test (3) *Walker Problem Behavior Identification Checklist (teacher) (blinding unclear)	
Notes	Data collected immediately.	
Risk of bias		
Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hughes 1992

Methods	Randomisation unspecified.
Participants	20 grade 10-11 girls enrolled in the schools 'at-risk' program + teacher nomination + ≥ 2 referrals in preceding year for 'conflict'.
Interventions	I1: Conflict management training (one school day) I2: Conflict management discussion (2 hours)
Outcomes	(1) *CBCL-TRF (Blinding unclear) (2) Rating scale of classroom behaviour (3) *Disciplinary referrals
Notes	Data collected at 2 weeks.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Hughes 1993

Methods	Randomisation by table of random numbers (but children in same family or classroom assigned to same condition).
Participants	51 grade 2-3 students nominated by teacher as aggressive and scoring ≥ 84 th centile on aggression and/or hostile isolation subscale of Miller School Behavior Checklist.
Interventions	I1: Problem solving skills training (2 x 45 minute sessions per week for 10 weeks). I2: Teacher consultations (4 x 30 minute sessions over 6 weeks)
Outcomes	(1) Breyer's Behavior Observation Schedule (2) CBCL (3) *Miller School Behavior Checklist - aggression subscale, teacher (blinding unclear) (4) Revised Class Play
Notes	Data collected immediately.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Ison 1997

Methods	Randomisation by coin toss.
Participants	39 boys aged 7-12 with scores >150 on Self control rating scale and >75 th percentile on each factor in the Child Behavior Report.
Interventions	I1: Social skills training (1 x 30 minute sessions per week for 14 weeks) C: No intervention
Outcomes	(1) Self control rating scale (teacher, blinding unclear) (2) *Child behavior report - aggression subscale (Teacher, blinding unclear) (3) Child behaviour scenario (self completed)

Ison 1997 (Continued)

Notes Data collection timing unclear.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Ison 2001

Methods	Randomisation by coin toss.
Participants	164 students aged 8-12 with scores >150 on Self control rating scale and >75th percentile on each factor in the Child Behavior Report.
Interventions	I: Social skills training (2 x 30 minute sessions per week for 7 weeks C: No intervention
Outcomes	(1) Self control rating scale (teacher, blinding unclear) (2) *Child behavior report - aggression subscale (Teacher, blinding unclear) (3) Child behaviour scenario (self completed)
Notes	Data collection timing unclear.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Jones 1991

Methods	Randomisation by drawing names from a hat (matched for sex).
Participants	18 year 8-9 students with highest score on CBCL aggression subscale (adolescents scale).
Interventions	I1: Aggression replacement training (structured learning + anger management + moral reasoning training) (3 x 60 minute session per week for 10 weeks). I2: Moral reasoning training (1 x 60 minute session per week for 10 weeks). C: No intervention
Outcomes	(1) *Behaviour Incident Reports - aggressive subscale, teacher (blinded) (2) Self control/impulsivity scale
Notes	Data collected immediately.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Lazerson 1980

Methods	Randomisation unspecified.
Participants	60 grade 2-8 students referred by teacher as aggressive and withdrawn, and verified by school counselor.
Interventions	I1: Tutor training (2 sessions) then tutoring for 20-30 minutes, 23 sessions over 5 weeks I2: Receipt of tutoring, as above C: No intervention
Outcomes	(1) Self concept scale (self, unblinded) (2a) *Devereaux Elementary School Behavior rating scale (DESB) aggressive subscale (teacher, unblinded) (2b) DESB withdrawn subscale (teacher, unblinded)
Notes	Data collected post intervention.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Lee 1979

Methods	Randomisation unspecified.
Participants	30 grade 9 students selected by peers as aggressive.
Interventions	I: Assertion training (1 x 50 minute session per week for 8 weeks). P: Decion making group (50 minutes per week for 8 weeks) C: No intervention
Outcomes	(1) *Peer Aggression Rating Scale, peers (blinding unclear) (2) Self-report Aggression Rating Scale
Notes	Data collected at 1 week.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Lochman 1993

Methods	Randomisation unspecified.
Participants	24 grade 3 students nominated by peers as least liked and most likely to fight.
Interventions	I: Social problem solving skills training (26 x 30 minute individual sessions + 8 group sessions, 2 per week for 6 months). C: No intervention
Outcomes	(1) *Teacher Behavior Check List - aggression subscale (unblinded at post test, blinded at follow-up) (2) Peer nomination screening - aggression subscale
Notes	Data collected immediately and at 12 months.

Lochman 1993 (Continued)

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

MACS 2002

Methods	Cluster randomisation by random number draw.
Participants	2181 students in grades 2,3,5 & 6 selected by teacher and peer nominations.
Interventions	I1: Family relationship intervention (1 x 60-90 minute session per week for 22 weeks) + I2 + C1. I2: Peer relationship training (1 x 60 minute session per week for 10 weeks in year 1 & 16 weeks in year 2) + C1. C1: Classroom prosocial skills training (2 x 60 minute sessions per week, 20 sessions per year, for 2 years). C2: No intervention
Outcomes	(1) Peer nomination Index (2) CBCL-TRF (blinding unclear) (3) Classroom observation of on-task behaviour (4) Delinquency questionnaire (5) Court record attendances
Notes	Data collected immediately and annually.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Meyer 1995

Methods	Randomisation by table of random numbers.
Participants	120 grade 4-6 students referred to school principal on more than one occasion for inappropriate behaviour.
Interventions	I: Peer mediation training (conflict resolution training) (2 days training + use of skills over 12 weeks). C: Use of peer mediation
Outcomes	(1) Self Perception Profile for Children (SPPC) - Behavioural conduct subscale (2) *SPPC - Teacher rating scale (blinding unclear) (3) *Disciplinary referrals
Notes	Data collected during 12 weeks after training.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Moody 1981

Methods	Randomisation by table of random numbers.
Participants	22 grade 7-8 boys having ≥ 3 tally marks for aggressive behaviour from teacher during a 1 week observation period.
Interventions	I: Assertion training (2 x 45 minute sessions per week for 5 weeks). P: Group counseling (Communication skills and decision making) (90 minutes per week for 5 weeks) C: No intervention
Outcomes	(1) *Pittsburgh Adjustment Survey Scale - aggressive behaviour subscale, teacher (blinding unclear) (2) Sears Aggression Scale (3) Teachers tally sheet
Notes	Data collected at 1 week.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Newton 1994

Methods	Stratified random allocation (rank ordered for scores). Method unspecified.
Participants	48 grade 7-8 students scoring $>$ median in 2/3 of Violent Incidents, Violence Scale Score (reflects severity of violent incidents) and Violence Index Score (indicates likelihood of referrals being for violence).
Interventions	I: Mentor program (minimum of 1 hour of contact per week between mentor and student for 1 semester) C: No mentoring, but allowed to participate in other school programs designed to improve behaviour, self esteem and academic performance
Outcomes	(1) School exclusions (2) Violence Scale Score (3) *Violence Index
Notes	Data collected during the mentoring period.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Oldfield 1982

Methods	Randomisation by drawing names from a box.
Participants	22 grade 4-6 students with ≥ 10 incidents of violent or aggressive behaviour during a 25 day observation period. 3 students had learning difficulties.
Interventions	I: Meditation training (90 minutes of training over 2 sessions, practiced daily for 10-20 minutes for 80 days). P: Behaviour charting training (90 minutes training then 15 minutes daily use for 80 days)
Outcomes	(1) *Violent/Aggressive Incident Form, teacher (blinded) (2) Rosenweig picture Frustration Study

Oldfield 1982 (Continued)

Notes Data collected during last 25 days of intervention.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Omizo 1988

Methods Randomisation by table of random numbers.

Participants 24 grade 4-6 students nominated by teacher as aggressive or hostile.

Interventions I: Counseling sessions (cognitive behavioural techniques) (1 x 45 minute session per week for 10 weeks). P: Watched films (1 x 45 minute session per week for 10 weeks).

Outcomes (1) *Miller School Behavior Checklist - aggression and hostile isolation subscales, teacher (blinded)

Notes Data collected at one week after intervention.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Pepler 1995

Methods Randomisation unspecified.

Participants 74 grade 1-6 students referred to a program for aggressive behaviour, disruption or non-compliance over a 2 year period, following teacher nomination.

Interventions I: Social Skills training (including some components of the 'Think Aloud' program) (2 x 75 minute sessions per week for 12-15 weeks). C: No intervention

Outcomes (1) CBCL - Parents (2) *CBCL-TRF (blinding unclear) (3) Revised Class Play

Notes Data collected immediately.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Petit 1998

Methods Randomisation unspecified (Intention to treat analysis not maintained).

Petit 1998 (Continued)

Participants	90 grade 9-12 students randomly selected from those assigned to alternative education programme for infractions of school discipline policy.
Interventions	I: Anger management + life skills training 50 minutes 2 x per week for 9 weeks P: No intervention watched educational videos with no anger management information C: No intervention
Outcomes	(1) State trait Anger Expression Inventory (participant, unblinded) (2) *CBCL-TRF (teacher, blinding unclear) (3) Positive behaviour survey (teacher, blinding unclear)
Notes	Data collected immediately.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Pietrucha 1998

Methods	Stratified by peer status. Randomisation unspecified.
Participants	32 grade 4-6 students peer selected as aggressive and not accepted, and self reported behavioural responses to provocation vignettes.
Interventions	I: Social goal modification program 45-60 minutes per week for 8 weeks P: Recreational activities 45-60 minutes per week for 8 weeks C: No intervention
Outcomes	(1) Ambiguous provocation vignettes (self) (2) Outcome values questionnaire (self) (3) Legitimacy of aggressive beliefs (self) (4) Peer behaviour nominations (blinding unclear) (5) Peer acceptance (blinding unclear) (6) *Teacher behaviour checklist (Coie) (Blinded) (7) Weshler IQ
Notes	Data collected immediately and at 2 months.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Prinz 1994

Methods	Cluster randomisation using coin toss.
Participants	25 grade 1-3 classes randomised, 95 students scoring ≥ 65 on aggressive subscale of CBCL-TRF, and 101 scoring ≤ 60 on aggressive subscale and $>$ median on communication effectiveness subscale.
Interventions	I: Peer coping skills training (1 x 50 minute session per week for 19-24 weeks) + Minimal classroom intervention (a class wide program to promote prosocial behaviour). C: Minimal classroom intervention only
Outcomes	(1) *CBCL-TRF aggression subscale (unblinded)

Prinz 1994 (Continued)

Notes Data collected immediately and at 6 months.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Quinn 1995

Methods Randomisation by coin toss.

Participants 30 7 year old students identified by teachers as aggressive on CBCL-TRF aggressive subscale, with poor academic engagement and playground activity and nominated by teachers as at risk of antisocial behaviour.

Interventions I: Co-operative learning (Interpersonal problem solving skills) (26 x 20 minute sessions over 6 weeks). C: No intervention

Outcomes (1) Systematic Screening for Behavior Disorders (2) *CBCL-TRF aggression subscale (blinding unclear)

Notes Data collection period unspecified.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Sackles 1981

Methods Randomisation unspecified.

Participants 35 grade 6-8 students scoring ≥ 1 SD above mean on Anger Inventory Scale (modified)

Interventions I1: Stress inoculation (1 x 45 minute session per week for 8 weeks). I2: Interpersonal cognitive problem solving. I3: Assertiveness training (45 minutes per week for 8 weeks) C: No intervention

Outcomes (1) Anger Inventory Scale (2) *Devereux Behavior Rating Scale, teacher (blinding unclear) (3) Laboratory provocation situations (4) Self report measure of anger

Notes Data collection period unspecified.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Sukhodolsky 2000

Methods	Randomisation unspecified. Randomisation broken for 3 boys due to scheduling problems.
Participants	33 grade 4-5 boys teacher nominated for anger related problems.
Interventions	I: Cognitive- behavioral anger control group therapy (40 minutes per week for 10 weeks) P: play activities + control of inappropriate behaviours by reward
Outcomes	(1) Pediatric anger expression scale (self) (2) Children's inventory of anger (self) (3) *Teacher Rating Scale (Finch) (teacher, blinded)
Notes	Data collected immediately post intervention.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Tanner 1988

Methods	Randomisation blocked by sex and grade, method unspecified.
Participants	24 grade 1-3 students nominated by teachers as having aggressive features during previous 6 months.
Interventions	I: Assertiveness social skills training (2 x 60 minute sessions per week for 3 weeks). P: Attention control group (120 minutes per week for 3 weeks)
Outcomes	(1) *Revised Parents Inventory of Childrens Skills, teacher (blinded) (2) Behavioural observations during (a) free play (b) structured test (c) transport home
Notes	Data collected immediately.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Teglasi 2001

Methods	Randomisation unspecified.
Participants	17 grade 4-5 students teacher nominated for disruptive, hostile and intrusive behaviour.
Interventions	I: STORIES program [social skills training + social problem solving + pretest] (60 minutes per week for 15 weeks) C: No intervention and no pretest
Outcomes	(1) *Composite of BASC - Behavioral Assessment System for Children - externalising subscale and School Social Behavior Scale - antisocial behavior subscale (teacher, unblinded) (2) NOBAG - Normative Beliefs about Aggression (self) (3) Treatment - Response Index (researcher, unblinded)
Notes	Data collected post intervention.

Teglasi 2001 (Continued)

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Tremblay 1991

Methods	Randomisation using computer generated table of random numbers.
Participants	172 kindergarten boys scoring $\geq 70\%$ on a preschool behaviour questionnaire for disruptive behaviour.
Interventions	I: Social skills training (9 sessions in year 1, 10 sessions in year 2) + Parents training (mean contact 17.4 sessions) + Fantasy training (25/46) (12 sessions) + Critical TV viewing (9/46) (9 sessions). C: No intervention
Outcomes	(1) *Social Behavior Questionnaire (SBQ) - Teacher completed (unblinded) (2) SBQ - Mother completed (3) Pupil Evaluation Inventory (4) Misbehaviour Questionnaire (5) *Violent delinquency at age 16/17
Notes	Data collected immediately, and at 1,2,6 & 7 years.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Walker 1998

Methods	Randomisation unspecified.
Participants	46 kindergarten to grade 2 students nominated by teacher and scoring high on CBCL-TRF and low on Academic Engaged Time scale.
Interventions	I: Teacher training (Praise, points and rewards) (2 x 20 minute sessions per day for 30 days) + Parent training (Lessons, guidelines and games) (6 x 60 minute sessions). C: No intervention
Outcomes	(1) Teacher ratings of maladaptive behaviour (2) *CBCL-TRF aggression subscale (blinded)
Notes	Data collected immediately and at 12 months.

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Duration of intervention is entered in brackets after the intervention. Where there are more than one intervention group, but the duration of intervention is the same for each group, the duration is only entered after the first group.

Outcomes preceded with an asterisk, indicate those chosen for data entry to meta-analysis (not all of these outcome measures had data available for inclusion in the meta-analysis).

Blinding (indicated in notes column) relates to the outcomes included in the meta-analysis only.

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
August 2001	Author stated to be primarily a community based programme. The school component of a multicomponent intervention is a summer school intervention, i.e. not delivered during the normal school routine.
Blue 1982	Unable to confirm whether allocation to intervention and control groups was random, and whether the intervention was school based. Unable to contact author.
Dubow 1987	Randomisation method poor.
DuRant 1996	Cluster randomisation of 2 schools. N = 2 studies excluded.
Gottfredson 1986	Excluded due to primary focus on delinquency prevention and not aggression.
Gottfredson 1987	Excluded due to primary focus on delinquency prevention and not aggression.
King 1990	A randomised controlled trial to assess a social development program. Unable to contact author to determine eligibility as a violence prevention programme. Published data collapsed groups, losing randomisation.
Larson 1992	Cluster randomisation of 2 classes. N = 2 studies excluded.
Lochman 1985	Subjects were allocated to groups quasi-randomly, using alternation.
Lochman 2002	Intervention primarily designed to reduce substance use.
Mason 1997	Subjects were allocated to groups quasi-randomly, using alternation.
Mayer 1983	Study designed to reduce vandalism costs and secondly to assess effect on disruptive behaviour. Not designed to reduce violent behaviour.
Miller 1990	1) Aim of study was to improve moral reasoning, rather than reduction of violent behaviour per se. 2) Personal communication with author to CD indicated that 'randomisation' was in fact by alternation.
Smith1991	Does not contain the terms violence, aggression, bullying, conflict or anger in either the title, abstract or study aims/hypotheses. It is intended to reduce delinquency and disruptive behaviour through improved self esteem.

Characteristics of ongoing studies *[ordered by study ID]*
Prinz 2000

Trial name or title	The Early Alliance Prevention Trial
Methods	
Participants	Grade 1 students rated by kindergarten teachers and parents in the top 20% for oppositional aggressive behaviour

Prinz 2000 (Continued)

Interventions	I1: Teacher training in classroom communication & management + classroom 'Good communication game' + targeted group peer relationship training, + reading mentoring + family intervention for high risk children I2: School wide conflict management program
Outcomes	(1) Disruptive behaviour disorders scale (parent, unblinded) (2) self report of antisocial behaviour and substance abuse (3) School failure (records, unblinded)
Starting date	1999
Contact information	
Notes	Outcomes to be collected at 5 and 8 years

Teglasi

Trial name or title	STORIES program
Methods	
Participants	Classes of emotionally disturbed children. Cluster randomised,
Interventions	I: STORIES program (social skills training + social problem solving) C: No intervention
Outcomes	(1) *Composite of BASC - Behavioral Assessment System for Children - externalising subscale and School Social Behavior Scale - antisocial behavior subscale (teacher, unblinded) (2) NOBAG - Normative Beliefs about Aggression (self) (3) Treatment - Response Index (researcher, unblinded)
Starting date	2001
Contact information	
Notes	

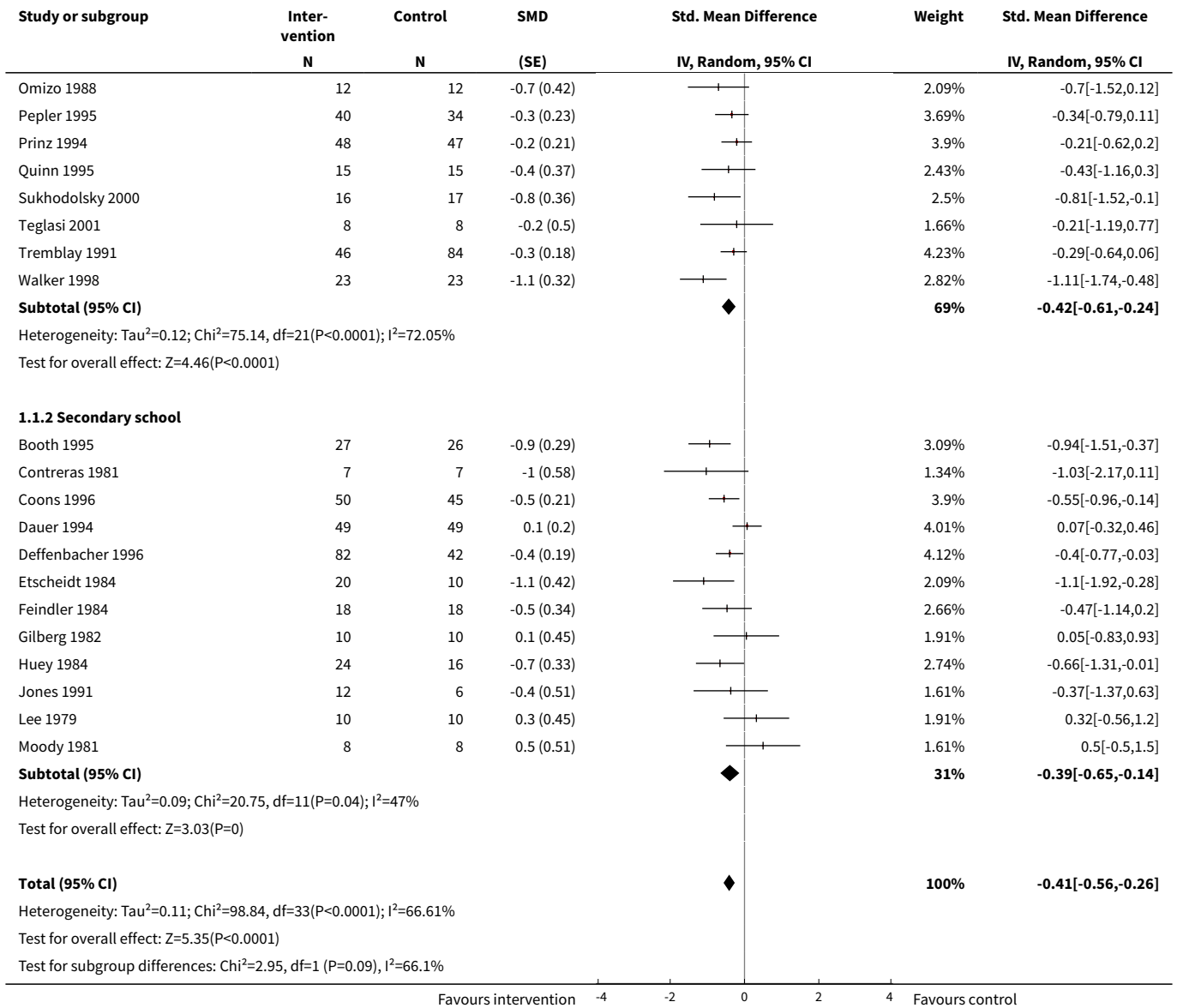
DATA AND ANALYSES
Comparison 1. Any violence prevention intervention versus no intervention by type of school

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression scale score or observed aggression by type of school (post test)	34	2939	SMD (Random, 95% CI)	-0.41 [-0.56, -0.26]
1.1 Primary school	22	2375	SMD (Random, 95% CI)	-0.42 [-0.61, -0.24]
1.2 Secondary school	12	564	SMD (Random, 95% CI)	-0.39 [-0.65, -0.14]

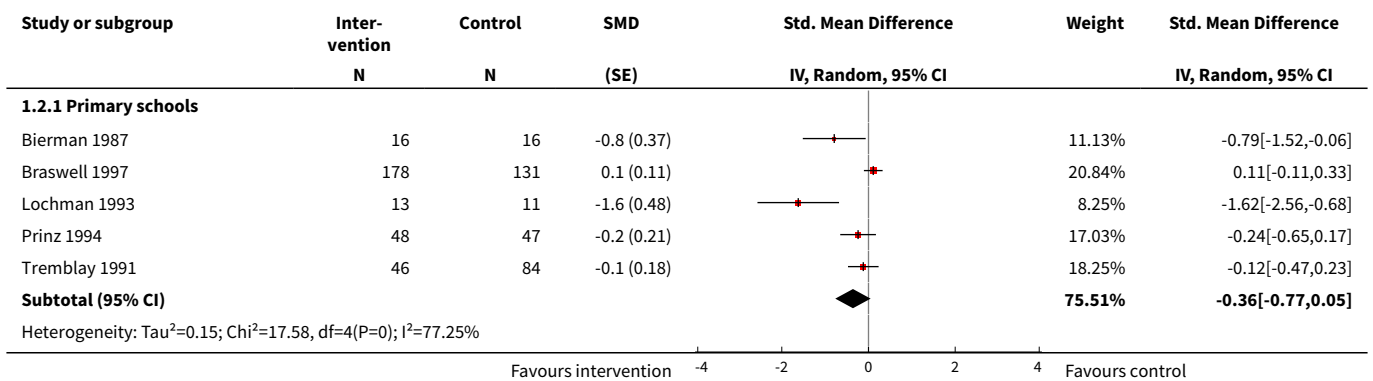
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2 Difference in aggression scale score or observed violence by type of school (up to 12/12)	7	673	SMD (Random, 95% CI)	-0.40 [-0.73, -0.06]
2.1 Primary schools	5	590	SMD (Random, 95% CI)	-0.36 [-0.77, 0.05]
2.2 Secondary schools	2	83	SMD (Random, 95% CI)	-0.53 [-0.98, -0.08]
3 Difference in school response to aggressive acts + other acts by school (post test)	9	1698	SMD (Random, 95% CI)	-0.48 [-1.16, 0.19]
3.1 Primary schools	2	939	SMD (Random, 95% CI)	0.15 [-0.37, 0.67]
3.2 Secondary schools	7	759	SMD (Random, 95% CI)	-0.69 [-1.49, 0.11]
4 Difference in school response to aggressive acts + other acts by school (up to 12 months)	2	83	SMD (Random, 95% CI)	0.03 [-0.42, 0.47]
4.1 Primary schools	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.2 Secondary schools	2	83	SMD (Random, 95% CI)	0.03 [-0.42, 0.47]

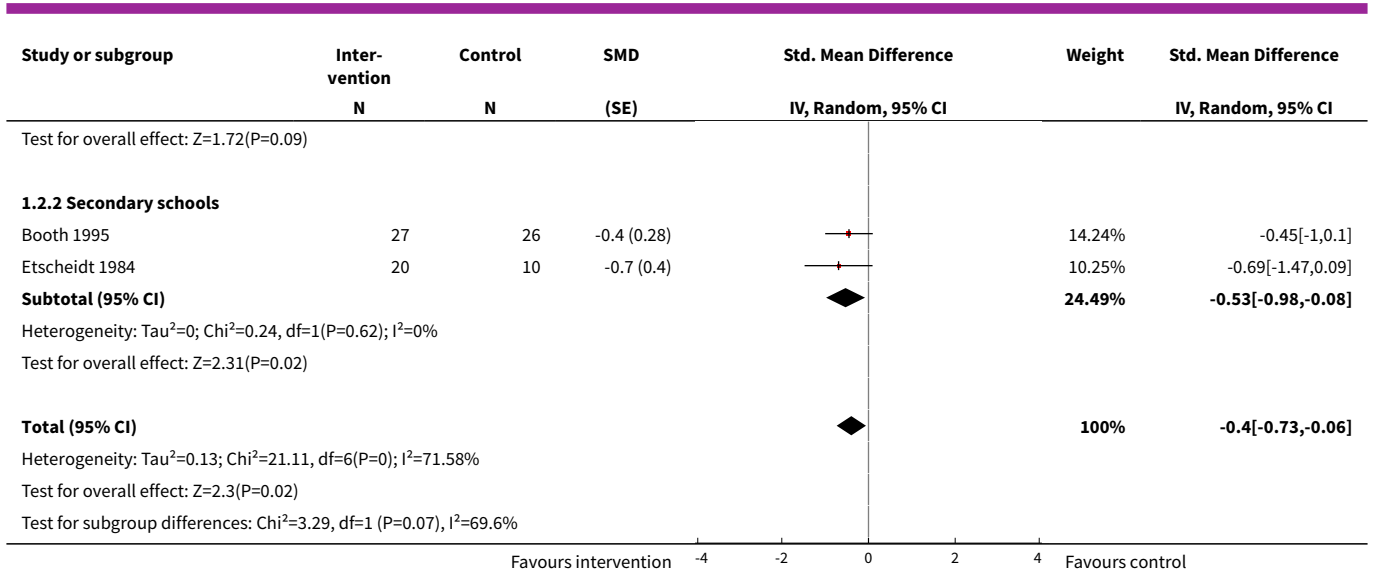
Analysis 1.1. Comparison 1 Any violence prevention intervention versus no intervention by type of school, Outcome 1 Difference in aggression scale score or observed aggression by type of school (post test).

Study or subgroup	Inter-vention N	Control N	SMD (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
1.1.1 Primary school						
Barkley 2000	77	39	-0.6 (0.2)		4.01%	-0.57[-0.96,-0.18]
Bierman 1987	16	16	-0.9 (0.38)		2.35%	-0.93[-1.67,-0.19]
Boswell 1983	42	20	0.2 (0.27)		3.28%	0.19[-0.34,0.72]
Braswell 1997	178	131	0.1 (0.11)		4.94%	0.05[-0.17,0.27]
Camp 1977	12	11	-0.4 (0.42)		2.09%	-0.43[-1.25,0.39]
CPPRG 1999	445	446	0 (0.07)		5.26%	0[-0.14,0.14]
Day 1993	16	16	-1 (0.38)		2.35%	-1.01[-1.75,-0.27]
Harris 1992	34	33	0.2 (0.24)		3.59%	0.19[-0.28,0.66]
Hudley 1993	24	24	-0.4 (0.29)		3.09%	-0.37[-0.94,0.2]
Ison 1997	20	19	-0.2 (0.32)		2.82%	-0.24[-0.87,0.39]
Ison 2001	90	74	-0.9 (0.17)		4.34%	-0.91[-1.24,-0.58]
Lochman 1993	13	11	-1.2 (0.45)		1.91%	-1.22[-2.1,-0.34]
Meyer 1995	49	49	-0.2 (0.2)		4.01%	-0.16[-0.55,0.23]
Oldfield 1982	11	11	-1.7 (0.51)		1.61%	-1.72[-2.72,-0.72]

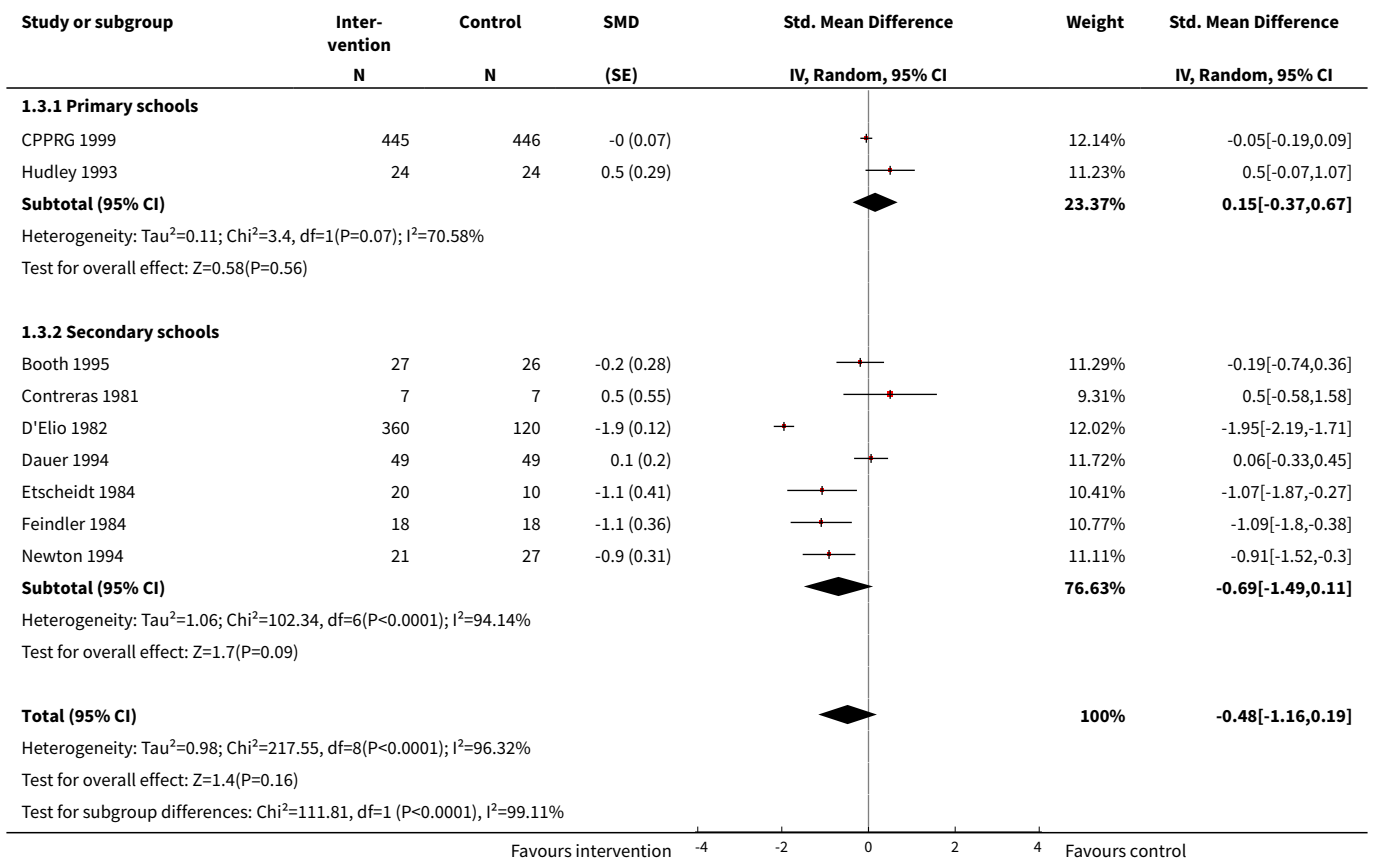


Analysis 1.2. Comparison 1 Any violence prevention intervention versus no intervention by type of school, Outcome 2 Difference in aggression scale score or observed violence by type of school (up to 12/12).

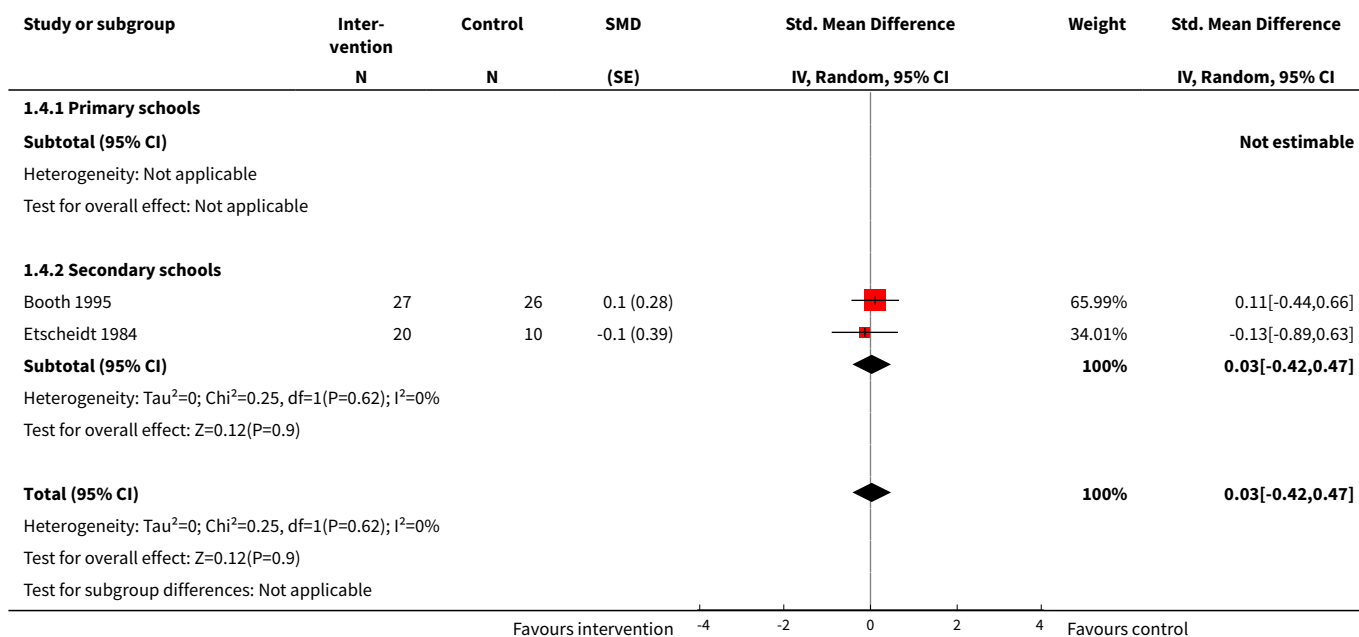




Analysis 1.3. Comparison 1 Any violence prevention intervention versus no intervention by type of school, Outcome 3 Difference in school response to aggressive acts + other acts by school (post test).



Analysis 1.4. Comparison 1 Any violence prevention intervention versus no intervention by type of school, Outcome 4 Difference in school response to aggressive acts + other acts by school (up to 12 months).

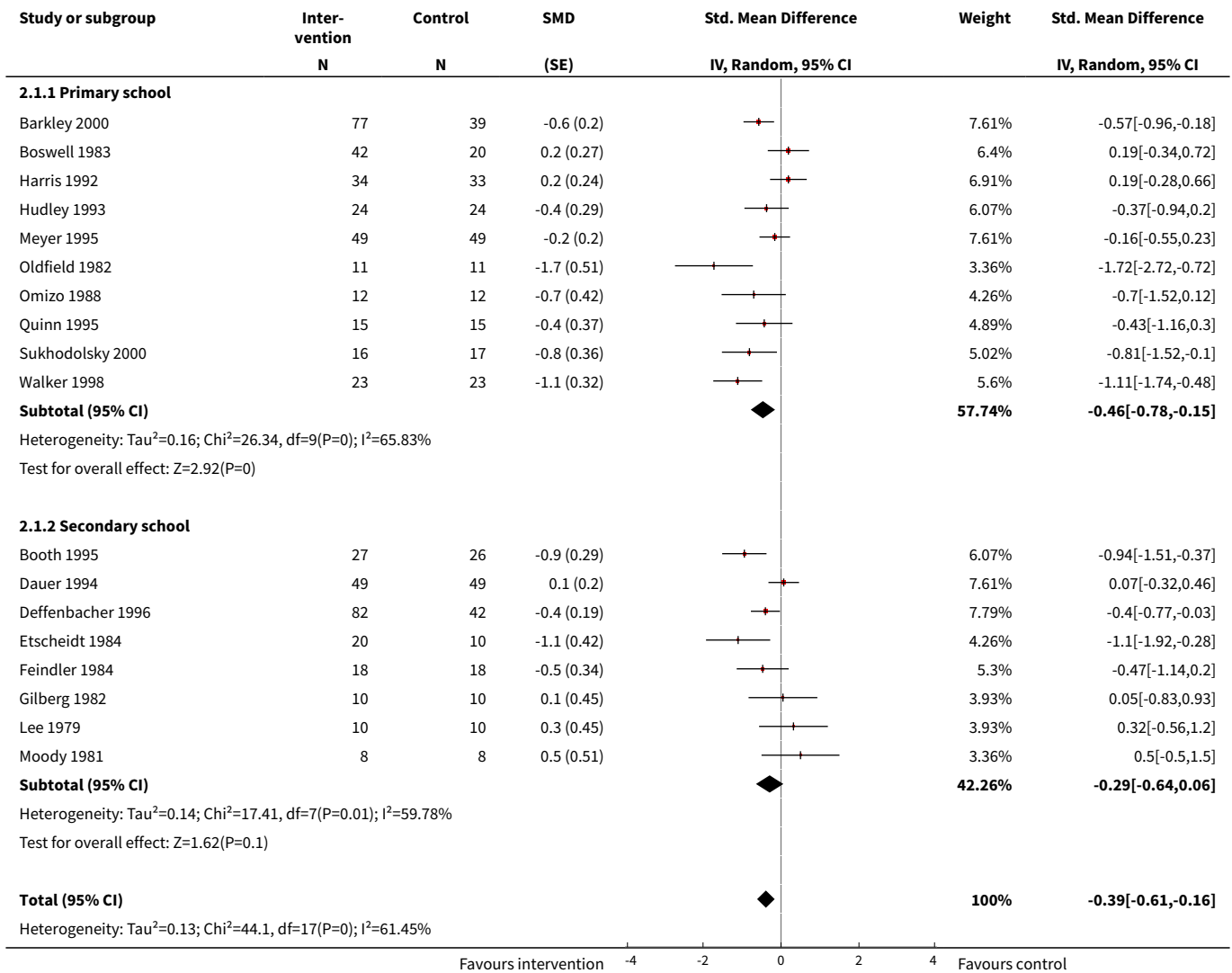


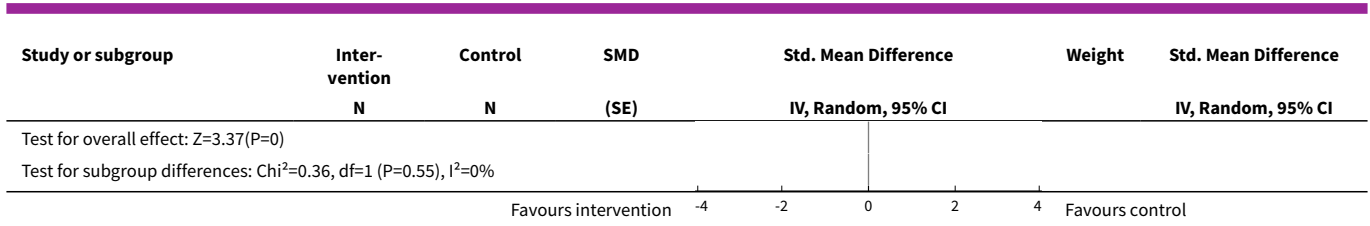
Comparison 2. Anger/conflict response interventions versus no intervention by type of school

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression scale score or observed aggression by type of school (post test)	18	943	SMD (Random, 95% CI)	-0.39 [-0.61, -0.16]
1.1 Primary school	10	546	SMD (Random, 95% CI)	-0.46 [-0.78, -0.15]
1.2 Secondary school	8	397	SMD (Random, 95% CI)	-0.29 [-0.64, 0.06]
2 Difference in aggression scale score or observed violence by type of school (up to 12/12)	2	83	SMD (Random, 95% CI)	-0.53 [-0.98, -0.08]
2.1 Primary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
2.2 Secondary school	2	83	SMD (Random, 95% CI)	-0.53 [-0.98, -0.08]
3 Difference in school response to aggressive acts + other acts by school (post test)	5	265	SMD (Random, 95% CI)	-0.30 [-0.85, 0.25]
3.1 Primary school	1	48	SMD (Random, 95% CI)	0.5 [-0.07, 1.07]

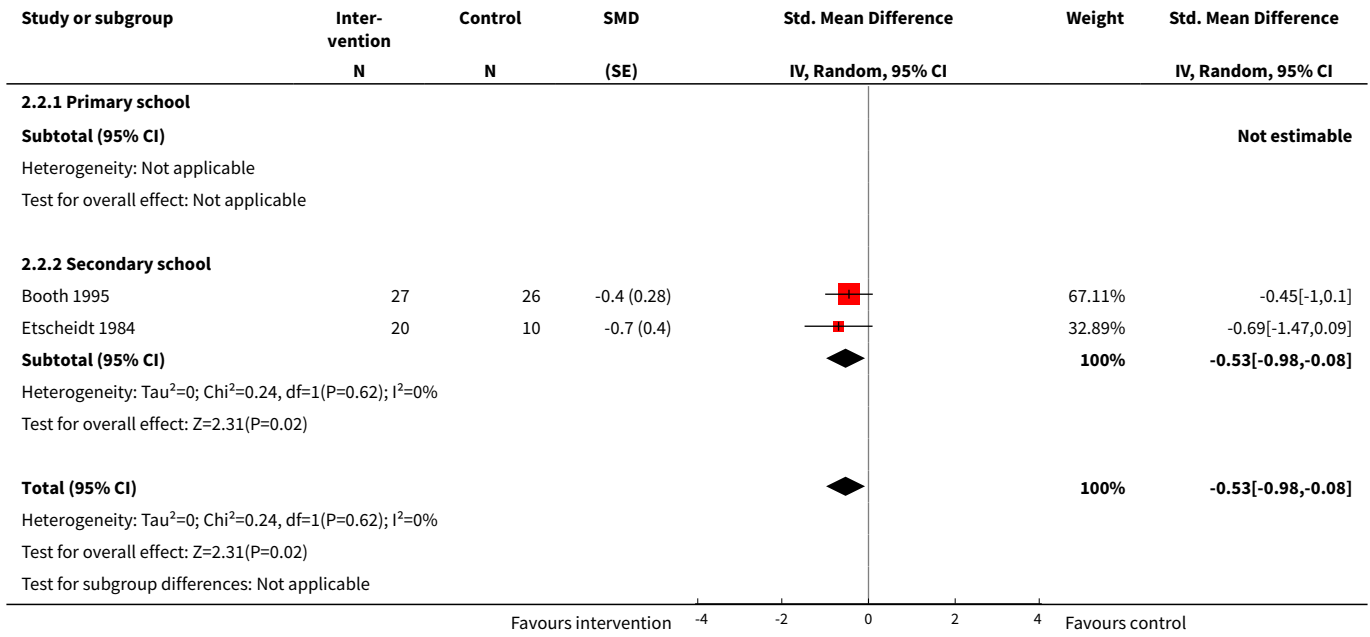
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3.2 Secondary school	4	217	SMD (Random, 95% CI)	-0.50 [-1.09, 0.08]
4 Difference in school response to aggressive acts + other acts by school (up to 12 months)	2	83	SMD (Random, 95% CI)	0.03 [-0.42, 0.47]
4.1 Primary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.2 Secondary school	2	83	SMD (Random, 95% CI)	0.03 [-0.42, 0.47]

Analysis 2.1. Comparison 2 Anger/conflict response interventions versus no intervention by type of school, Outcome 1 Difference in aggression scale score or observed aggression by type of school (post test).

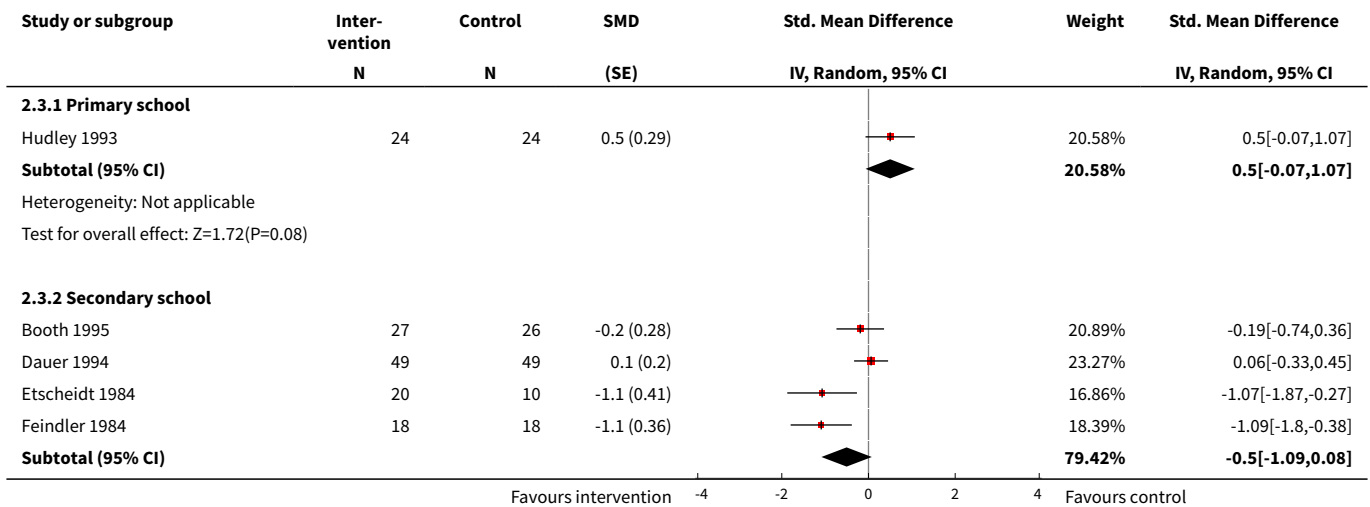


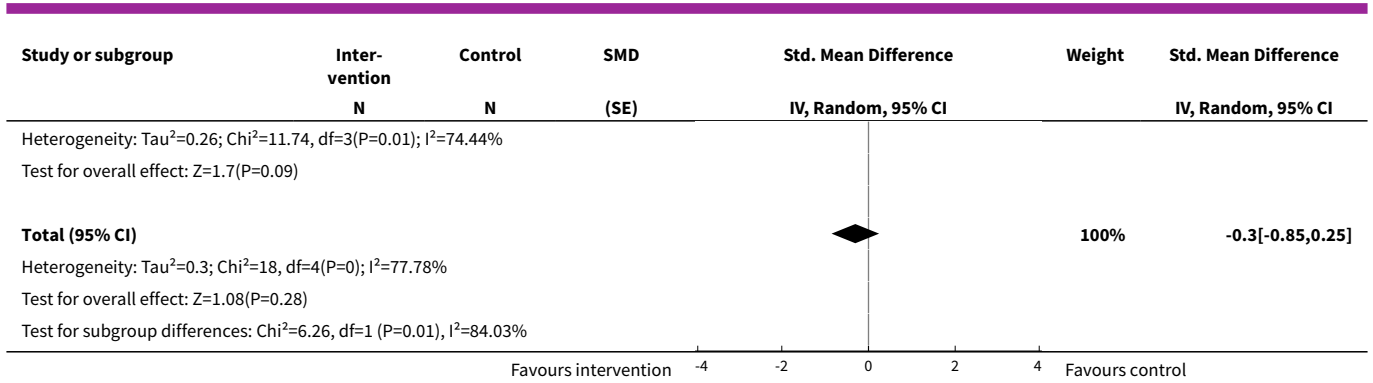


Analysis 2.2. Comparison 2 Anger/conflict response interventions versus no intervention by type of school, Outcome 2 Difference in aggression scale score or observed violence by type of school (up to 12/12).

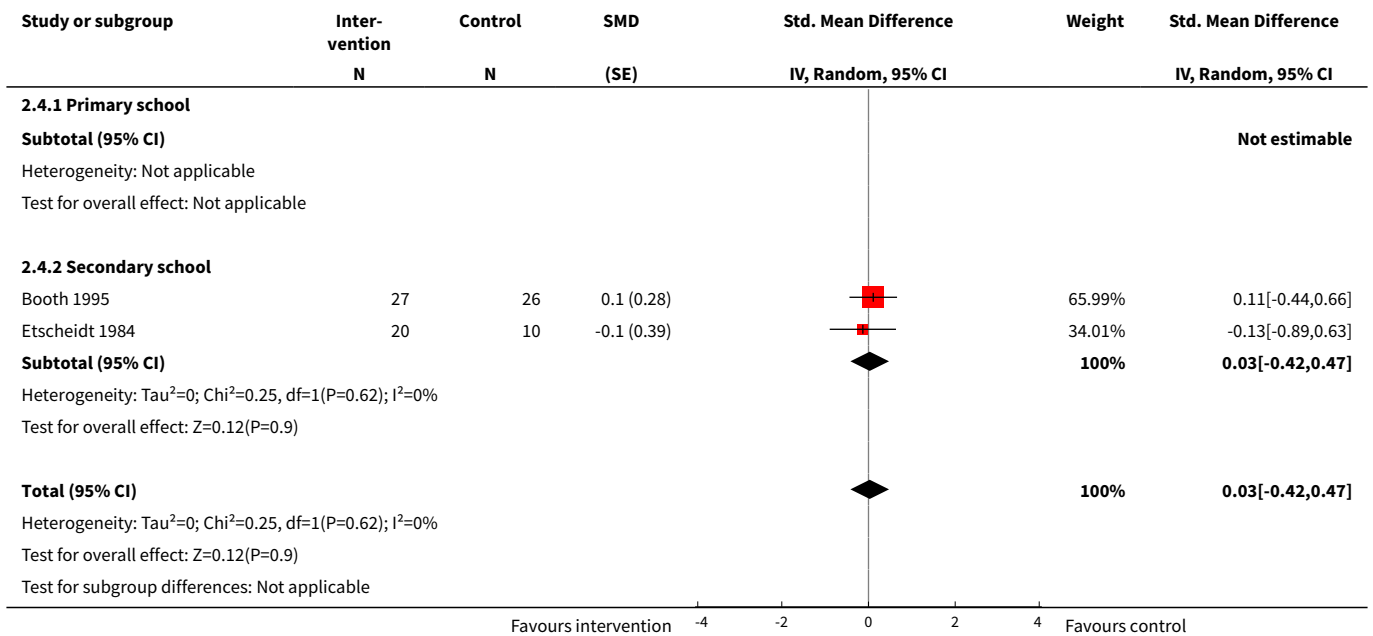


Analysis 2.3. Comparison 2 Anger/conflict response interventions versus no intervention by type of school, Outcome 3 Difference in school response to aggressive acts + other acts by school (post test).





Analysis 2.4. Comparison 2 Anger/conflict response interventions versus no intervention by type of school, Outcome 4 Difference in school response to aggressive acts + other acts by school (up to 12 months).

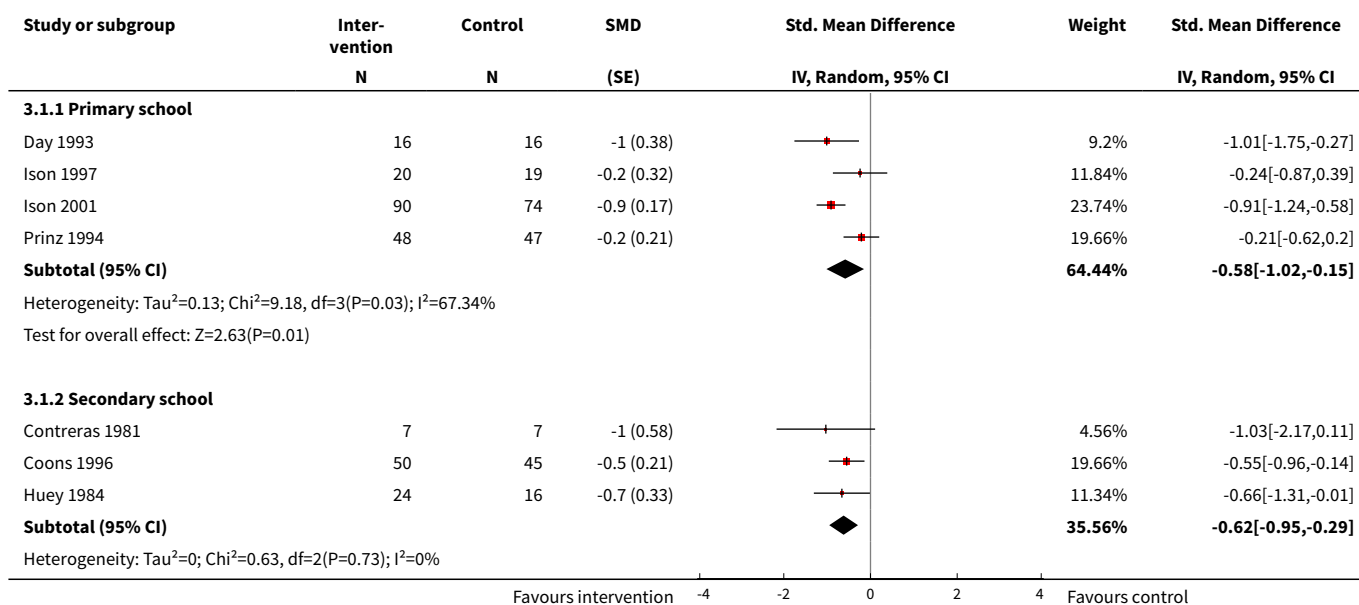


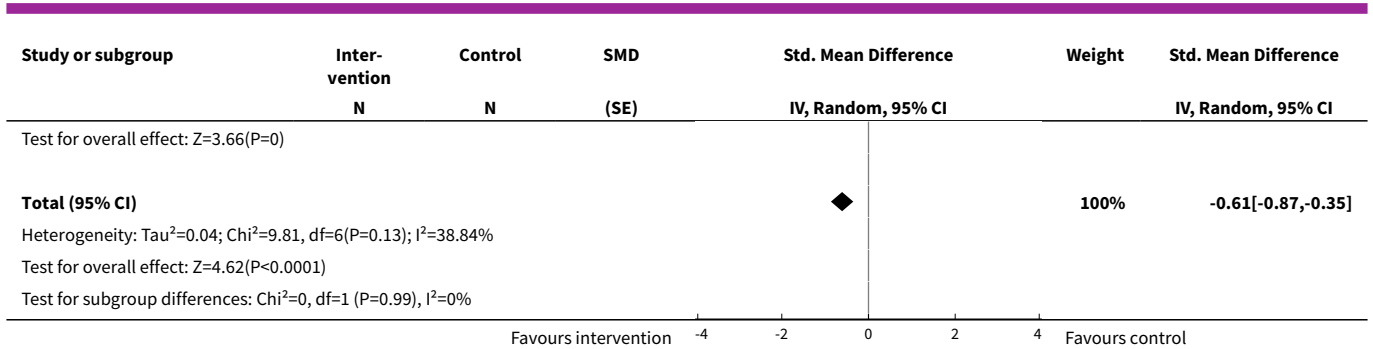
Comparison 3. Social skills & context interventions versus no intervention by type of school

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression scale score or observed aggression by type of school (post test)	7	479	SMD (Random, 95% CI)	-0.61 [-0.87, -0.35]
1.1 Primary school	4	330	SMD (Random, 95% CI)	-0.58 [-1.02, -0.15]
1.2 Secondary school	3	149	SMD (Random, 95% CI)	-0.62 [-0.95, -0.29]

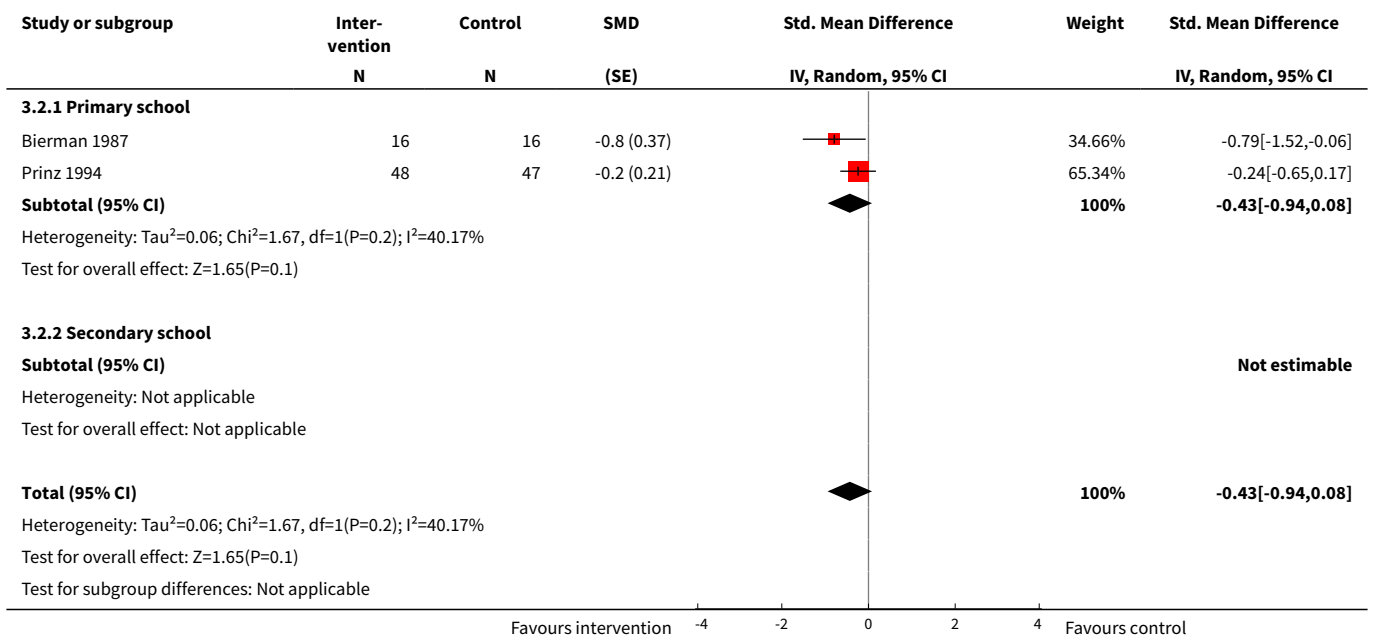
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2 Difference in aggression scale score or observed violence by type of school (up to 12/12)	2	127	SMD (Random, 95% CI)	-0.43 [-0.94, 0.08]
2.1 Primary school	2	127	SMD (Random, 95% CI)	-0.43 [-0.94, 0.08]
2.2 Secondary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
3 Difference in school response to aggressive acts + other acts by school (post test)	2	62	SMD (Random, 95% CI)	-0.28 [-1.65, 1.10]
3.1 Primary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
3.2 Secondary school	2	62	SMD (Random, 95% CI)	-0.28 [-1.65, 1.10]
4 Difference in school response to aggressive acts + other acts by school (up to 12 months)	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.1 Primary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.2 Secondary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]

Analysis 3.1. Comparison 3 Social skills & context interventions versus no intervention by type of school, Outcome 1 Difference in aggression scale score or observed aggression by type of school (post test).

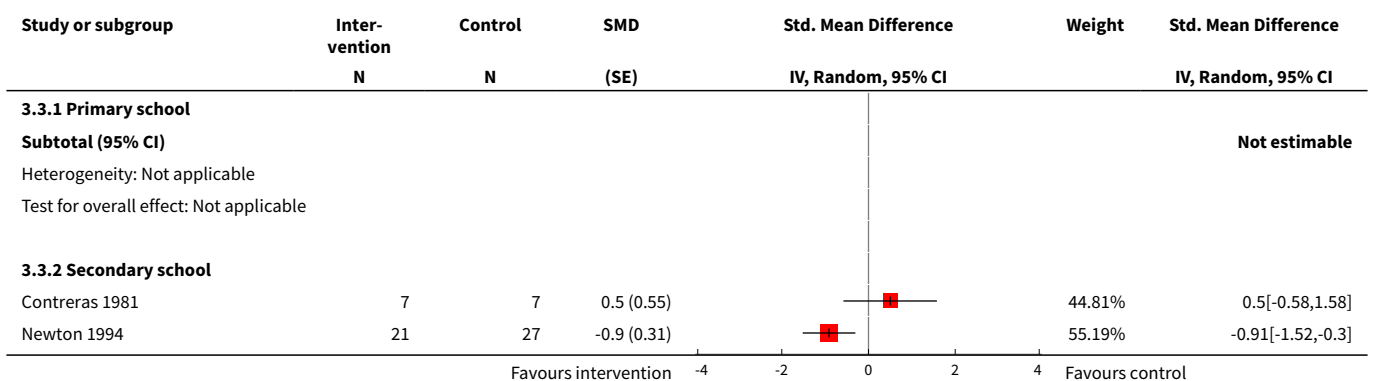


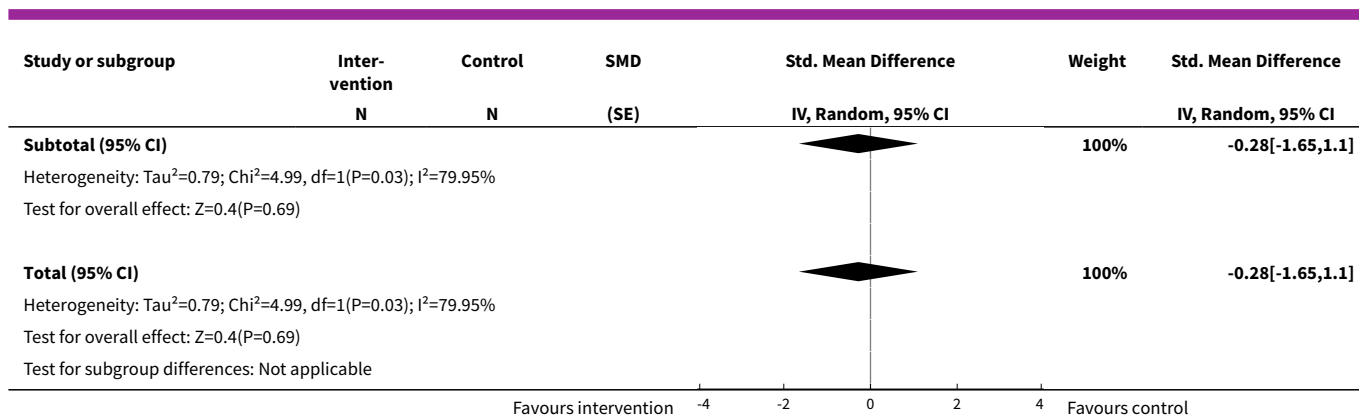


Analysis 3.2. Comparison 3 Social skills & context interventions versus no intervention by type of school, Outcome 2 Difference in aggression scale score or observed violence by type of school (up to 12/12).



Analysis 3.3. Comparison 3 Social skills & context interventions versus no intervention by type of school, Outcome 3 Difference in school response to aggressive acts + other acts by school (post test).



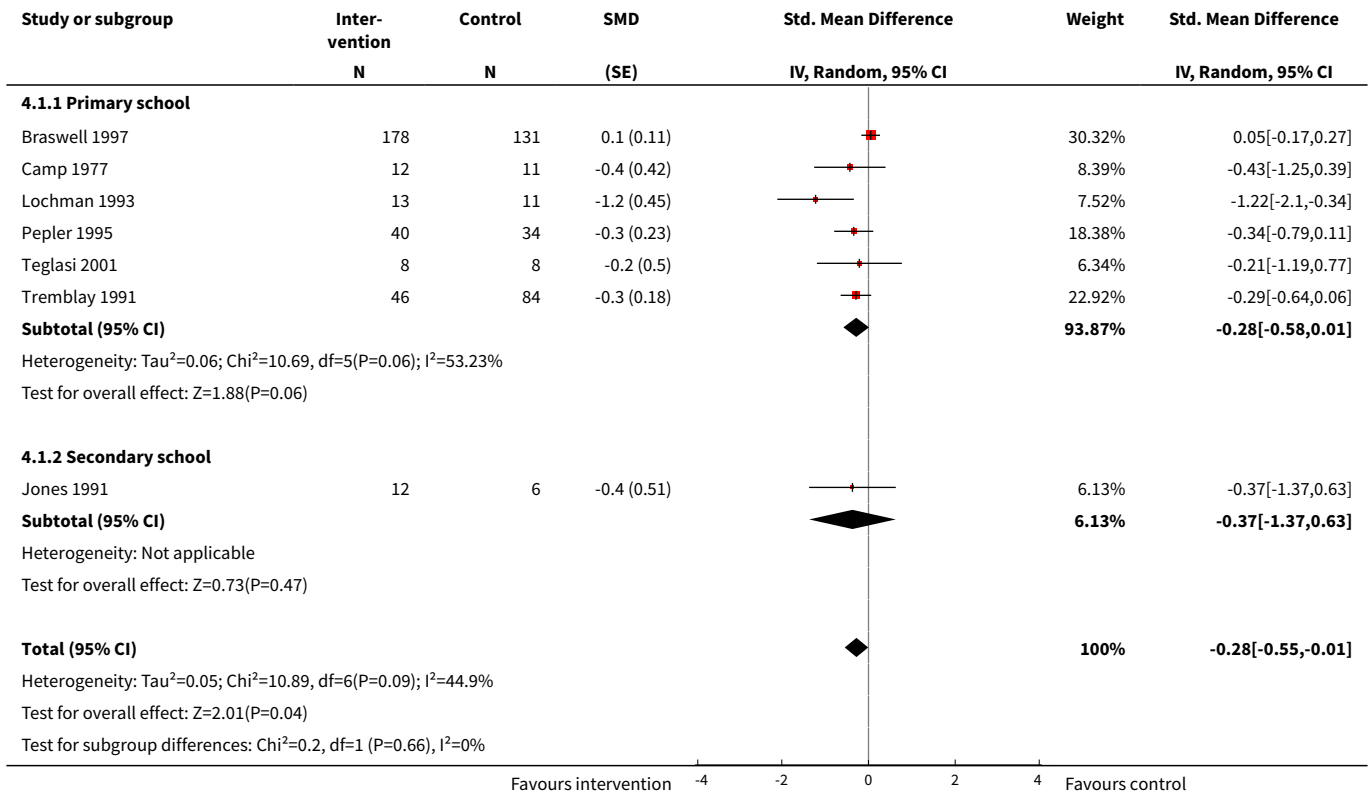


Comparison 4. Combined anger response & social skills interventions versus no intervention by type of school

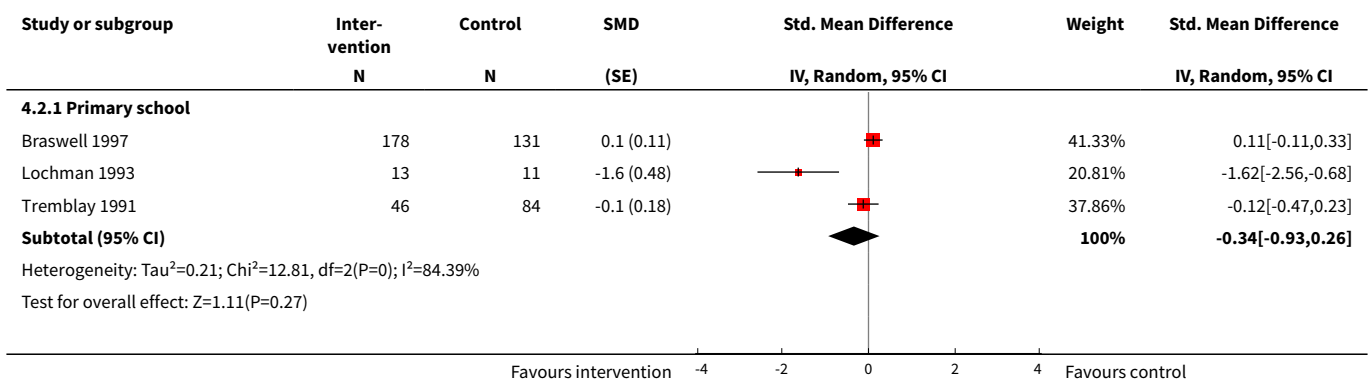
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression scale score or observed aggression by type of school (post test)	7	594	SMD (Random, 95% CI)	-0.28 [-0.55, -0.01]
1.1 Primary school	6	576	SMD (Random, 95% CI)	-0.28 [-0.58, 0.01]
1.2 Secondary school	1	18	SMD (Random, 95% CI)	-0.37 [-1.37, 0.63]
2 Difference in aggression scale score or observed violence by type of school (up to 12/12)	3	463	SMD (Random, 95% CI)	-0.34 [-0.93, 0.26]
2.1 Primary school	3	463	SMD (Random, 95% CI)	-0.34 [-0.93, 0.26]
2.2 Secondary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
3 Difference in school response to aggressive acts + other acts by school (post test)	1	480	SMD (Random, 95% CI)	-1.95 [-2.19, -1.71]
3.1 Primary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
3.2 Secondary school	1	480	SMD (Random, 95% CI)	-1.95 [-2.19, -1.71]
4 Difference in school response to aggressive acts + other acts by school (up to 12 months)	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.1 Primary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]

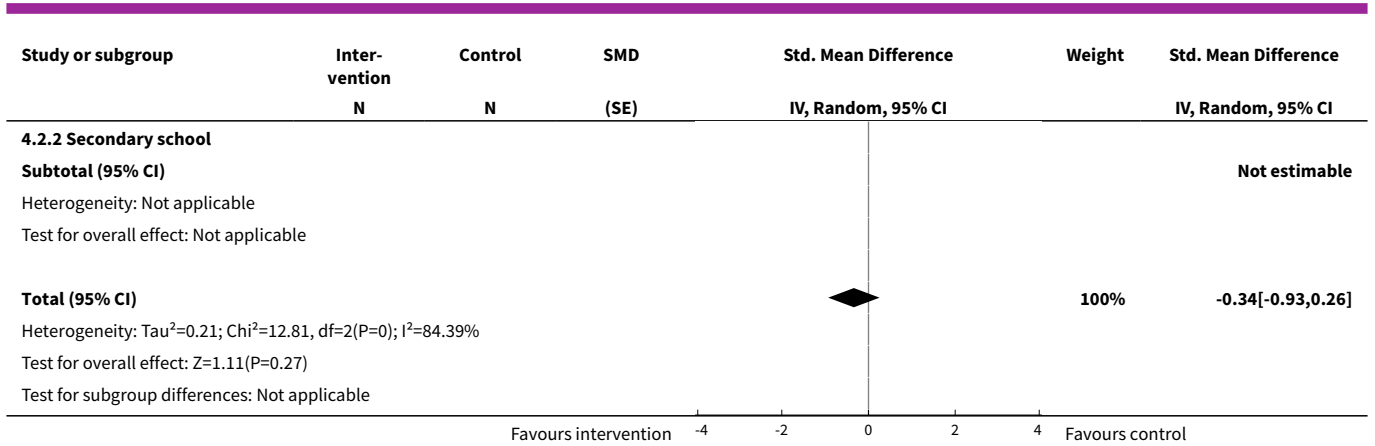
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4.2 Secondary school	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]

Analysis 4.1. Comparison 4 Combined anger response & social skills interventions versus no intervention by type of school, Outcome 1 Difference in aggression scale score or observed aggression by type of school (post test).

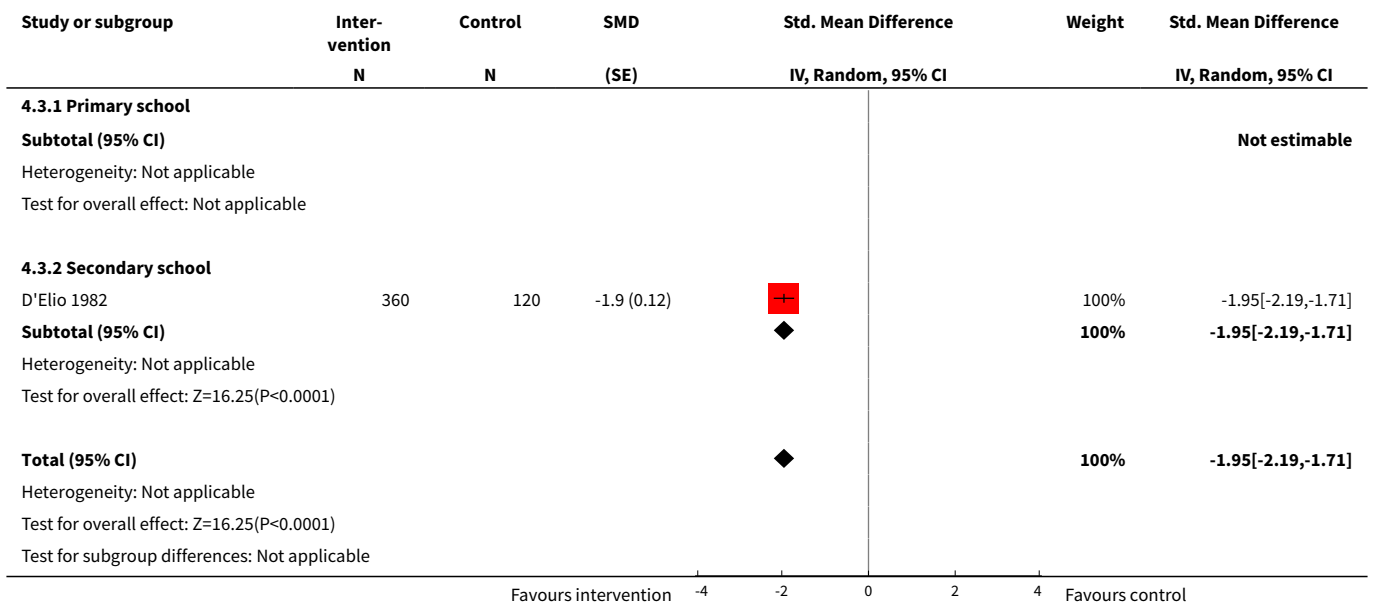


Analysis 4.2. Comparison 4 Combined anger response & social skills interventions versus no intervention by type of school, Outcome 2 Difference in aggression scale score or observed violence by type of school (up to 12/12).





Analysis 4.3. Comparison 4 Combined anger response & social skills interventions versus no intervention by type of school, Outcome 3 Difference in school response to aggressive acts + other acts by school (post test).

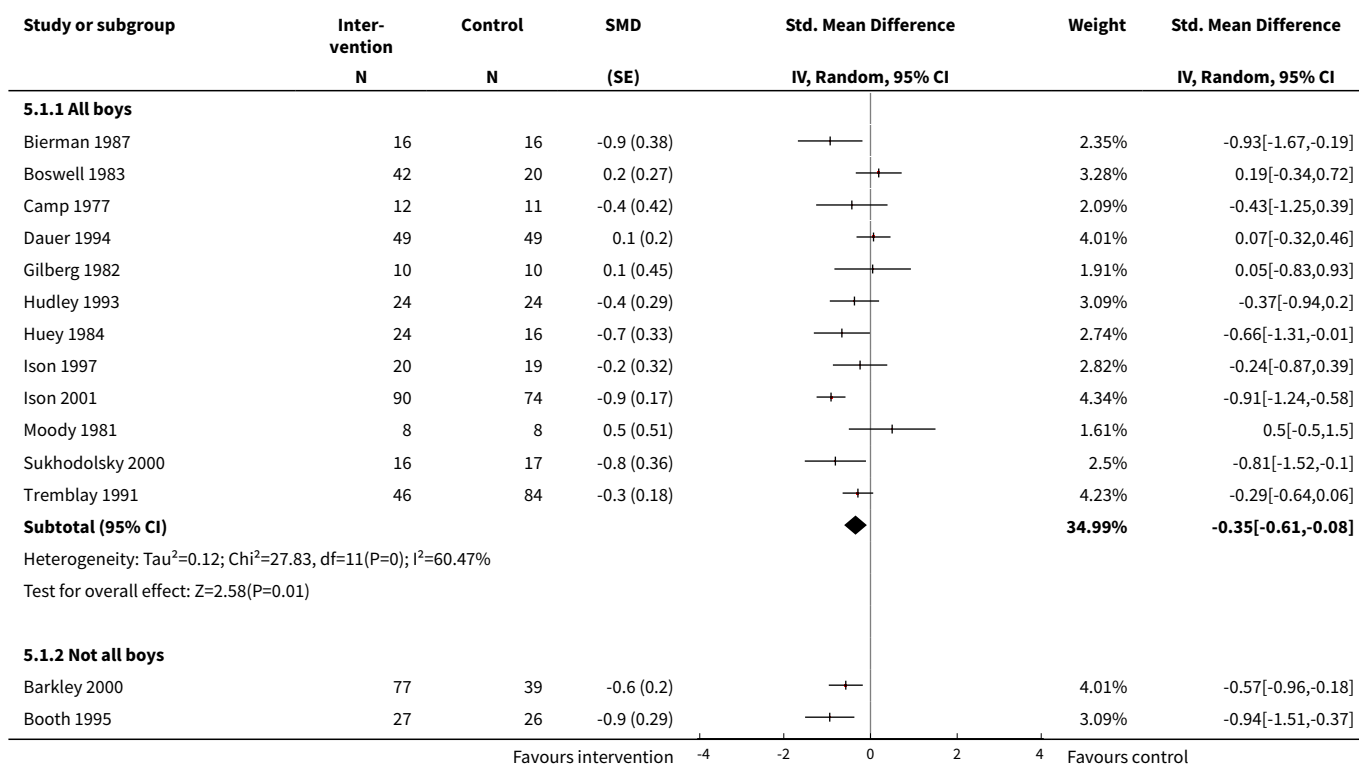


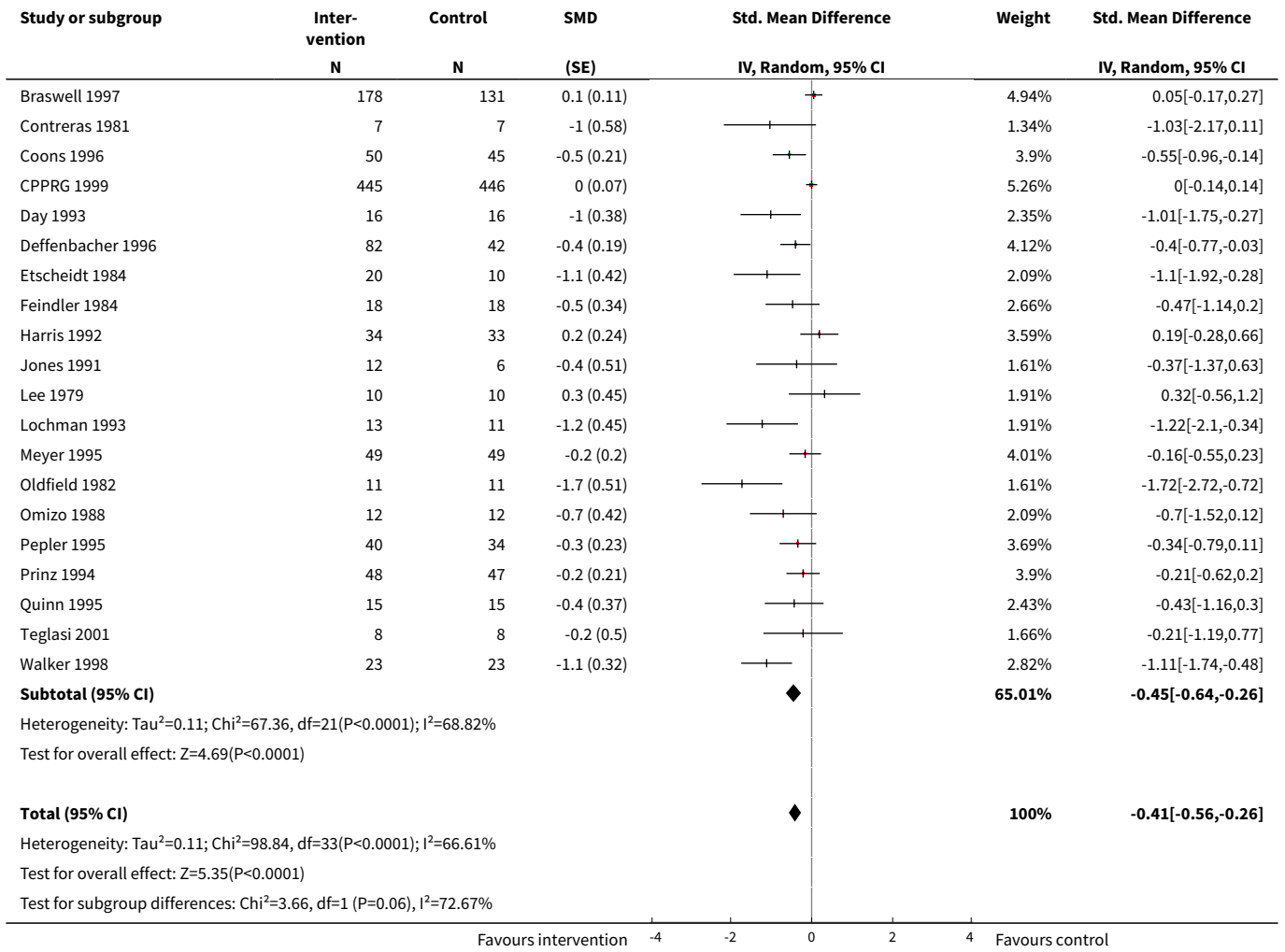
Comparison 5. Any violence prevention intervention versus no intervention by sex

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression scale score or observed aggression by sex (post test)	34	2939	SMD (Random, 95% CI)	-0.41 [-0.56, -0.26]
1.1 All boys	12	705	SMD (Random, 95% CI)	-0.35 [-0.61, -0.08]
1.2 Not all boys	22	2234	SMD (Random, 95% CI)	-0.45 [-0.64, -0.26]

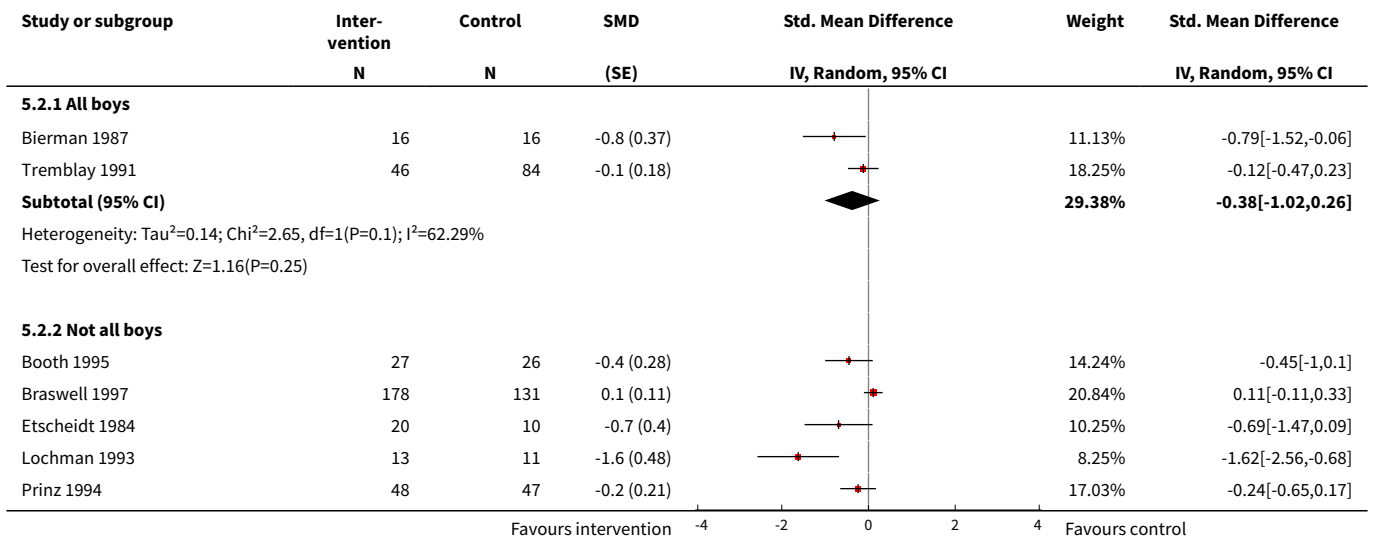
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2 Difference in aggression scale score or observed aggression by sex (up to 12 months)	7	673	SMD (Random, 95% CI)	-0.40 [-0.73, -0.06]
2.1 All boys	2	162	SMD (Random, 95% CI)	-0.38 [-1.02, 0.26]
2.2 Not all boys	5	511	SMD (Random, 95% CI)	-0.44 [-0.91, 0.02]
3 Difference in school response to aggressive acts + other acts by sex (post test)	9	1698	SMD (Random, 95% CI)	-0.48 [-1.16, 0.19]
3.1 All boys	2	146	SMD (Random, 95% CI)	0.23 [-0.19, 0.65]
3.2 Not all boys	7	1552	SMD (Random, 95% CI)	-0.70 [-1.54, 0.13]
4 Difference in school response to aggressive acts + other acts by sex (up to 12 months)	2	83	SMD (Random, 95% CI)	0.03 [-0.42, 0.47]
4.1 All boys	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.2 Not all boys	2	83	SMD (Random, 95% CI)	0.03 [-0.42, 0.47]

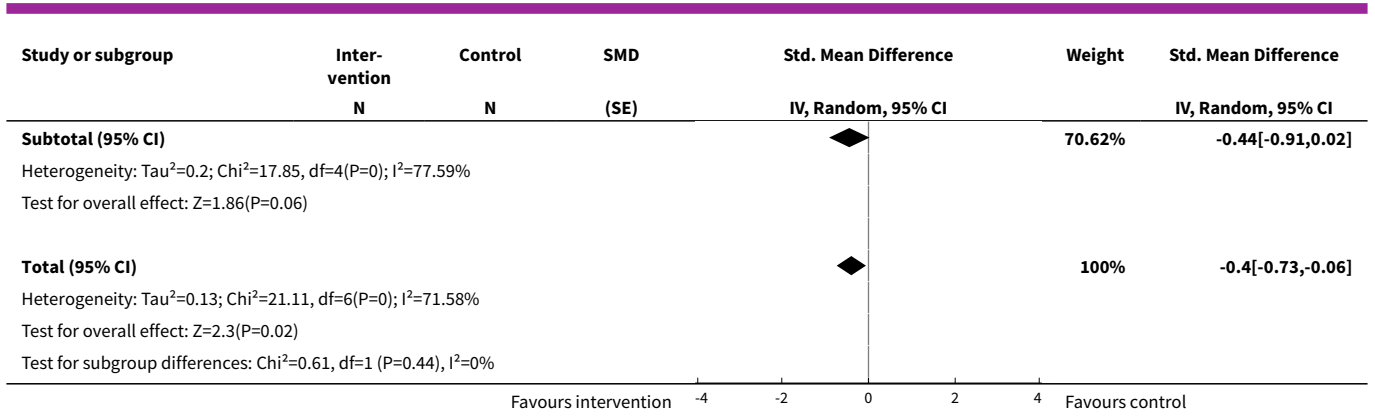
Analysis 5.1. Comparison 5 Any violence prevention intervention versus no intervention by sex, Outcome 1 Difference in aggression scale score or observed aggression by sex (post test).



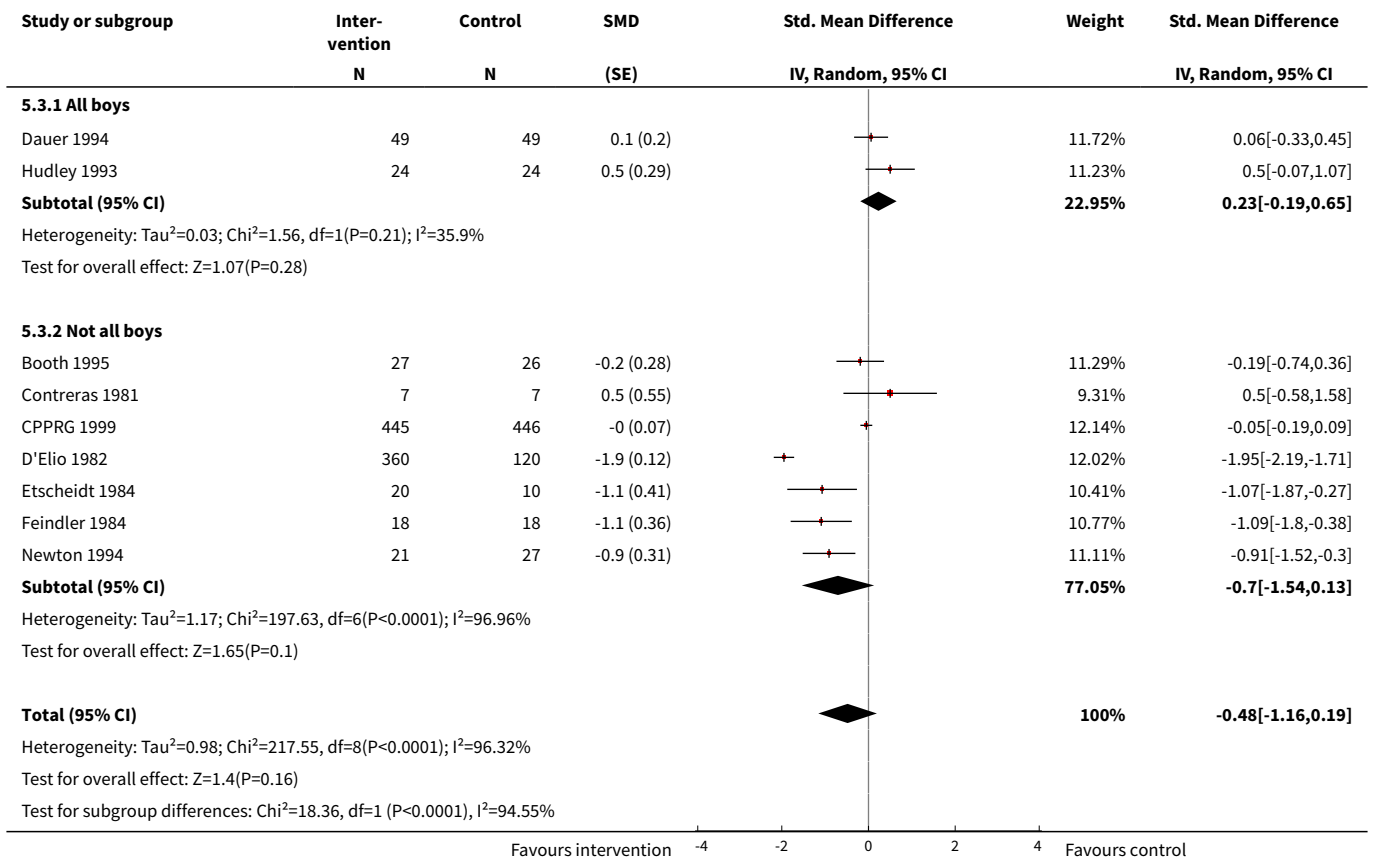


Analysis 5.2. Comparison 5 Any violence prevention intervention versus no intervention by sex, Outcome 2 Difference in aggression scale score or observed aggression by sex (up to 12 months).

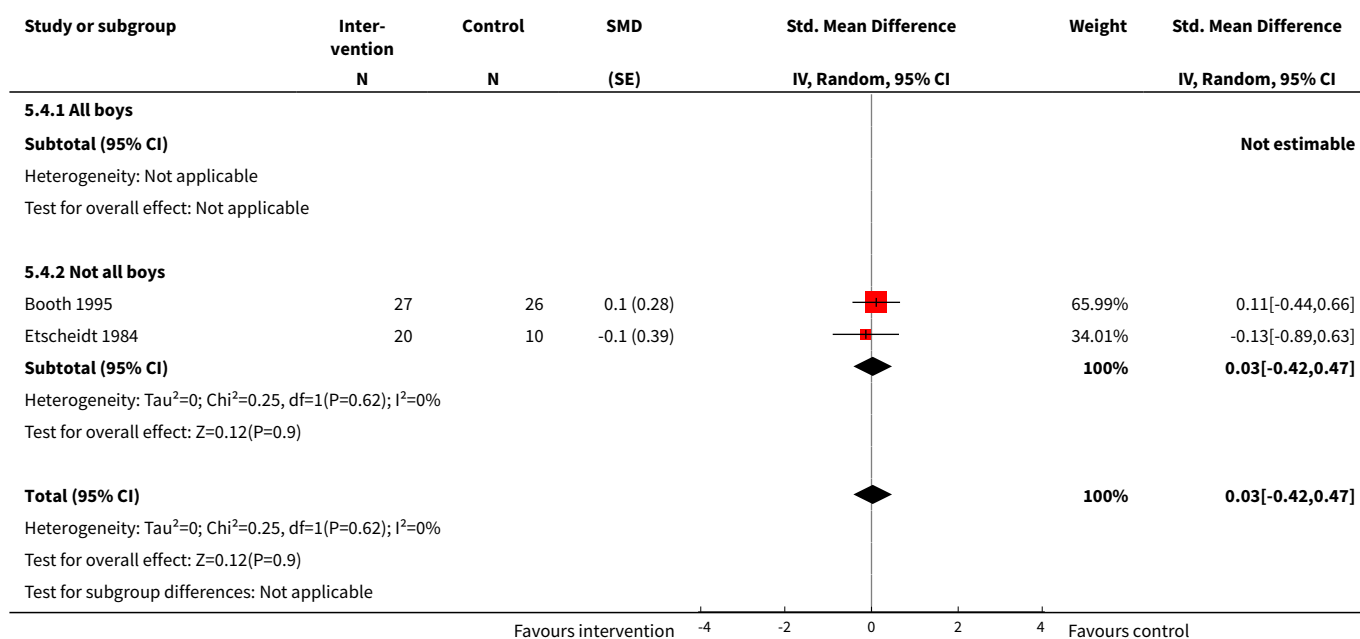




Analysis 5.3. Comparison 5 Any violence prevention intervention versus no intervention by sex, Outcome 3 Difference in school response to aggressive acts + other acts by sex (post test).



Analysis 5.4. Comparison 5 Any violence prevention intervention versus no intervention by sex, Outcome 4 Difference in school response to aggressive acts + other acts by sex (up to 12 months).

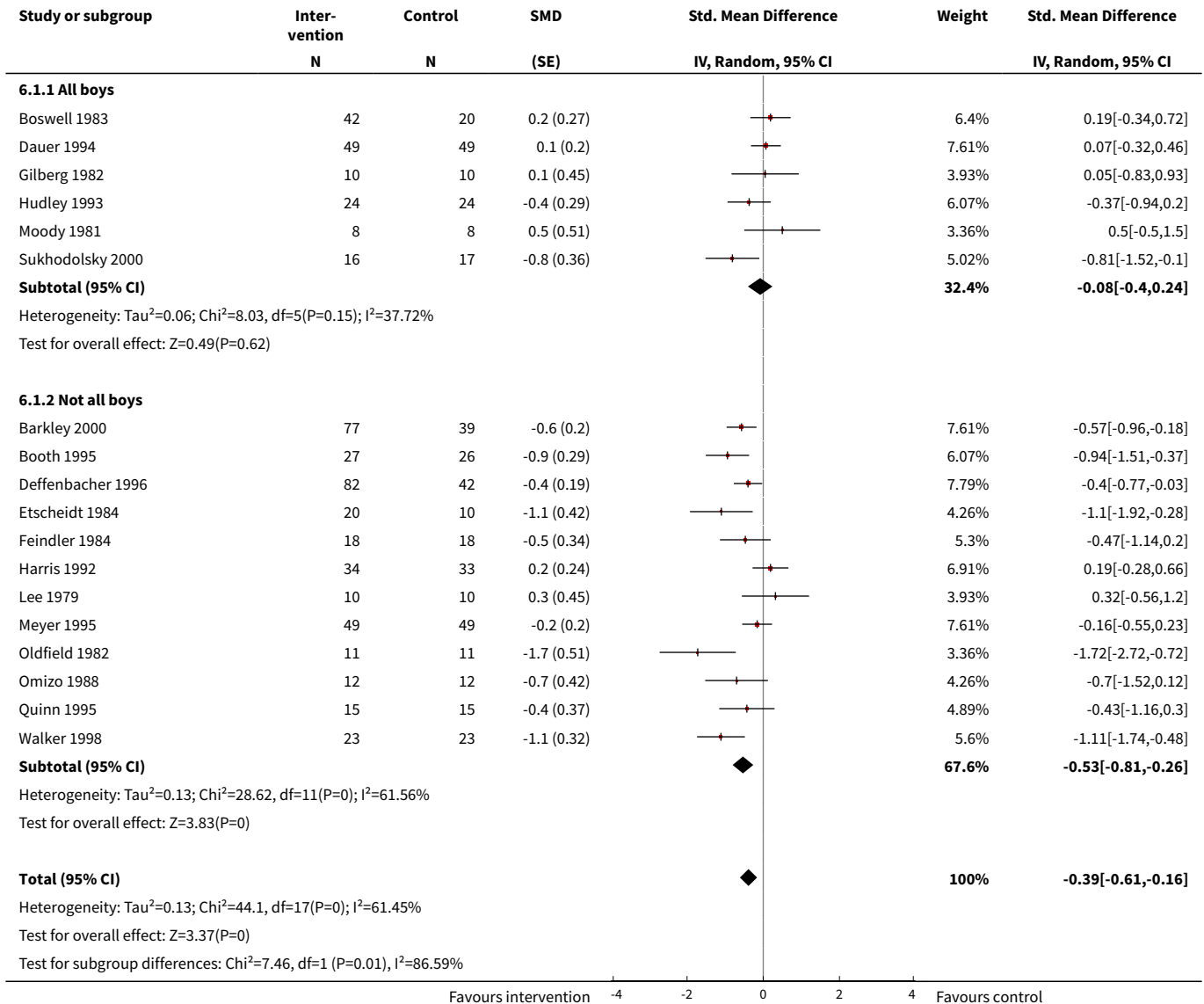


Comparison 6. Anger/conflict response interventions versus no intervention by sex

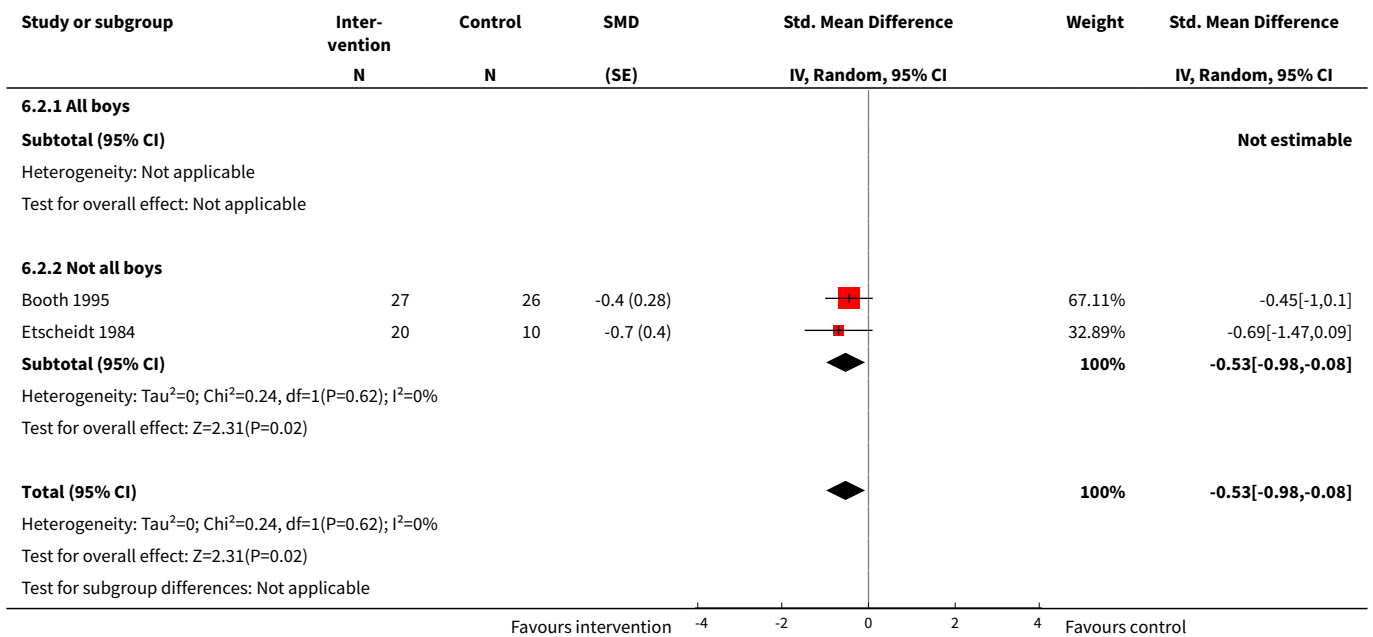
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression scale score or observed aggression by sex (post test)	18	943	SMD (Random, 95% CI)	-0.39 [-0.61, -0.16]
1.1 All boys	6	277	SMD (Random, 95% CI)	-0.08 [-0.40, 0.24]
1.2 Not all boys	12	666	SMD (Random, 95% CI)	-0.53 [-0.81, -0.26]
2 Difference in aggression scale score or observed violence by sex (up to 12 months)	2	83	SMD (Random, 95% CI)	-0.53 [-0.98, -0.08]
2.1 All boys	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
2.2 Not all boys	2	83	SMD (Random, 95% CI)	-0.53 [-0.98, -0.08]
3 Difference in school response to aggressive acts + other acts by sex (post test)	5	152	SMD (Random, 95% CI)	0.23 [-0.19, 0.65]
3.1 All boys	2	146	SMD (Random, 95% CI)	0.23 [-0.19, 0.65]
3.2 Not all boys	3	6	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4 Difference in school response to aggressive acts + other acts by sex (up to 12 months)	2	83	SMD (Random, 95% CI)	0.03 [-0.42, 0.47]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4.1 All boys	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.2 Not all boys	2	83	SMD (Random, 95% CI)	0.03 [-0.42, 0.47]

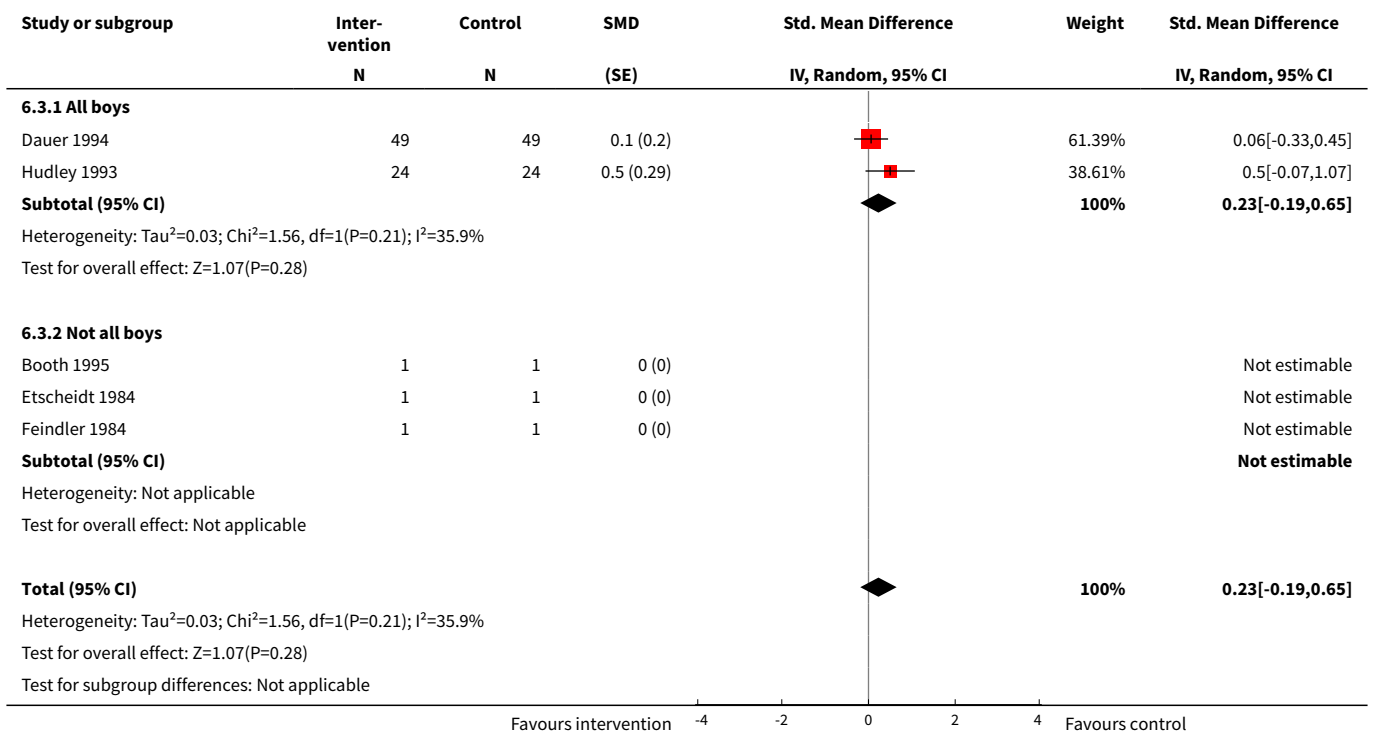
Analysis 6.1. Comparison 6 Anger/conflict response interventions versus no intervention by sex, Outcome 1 Difference in aggression scale score or observed aggression by sex (post test).



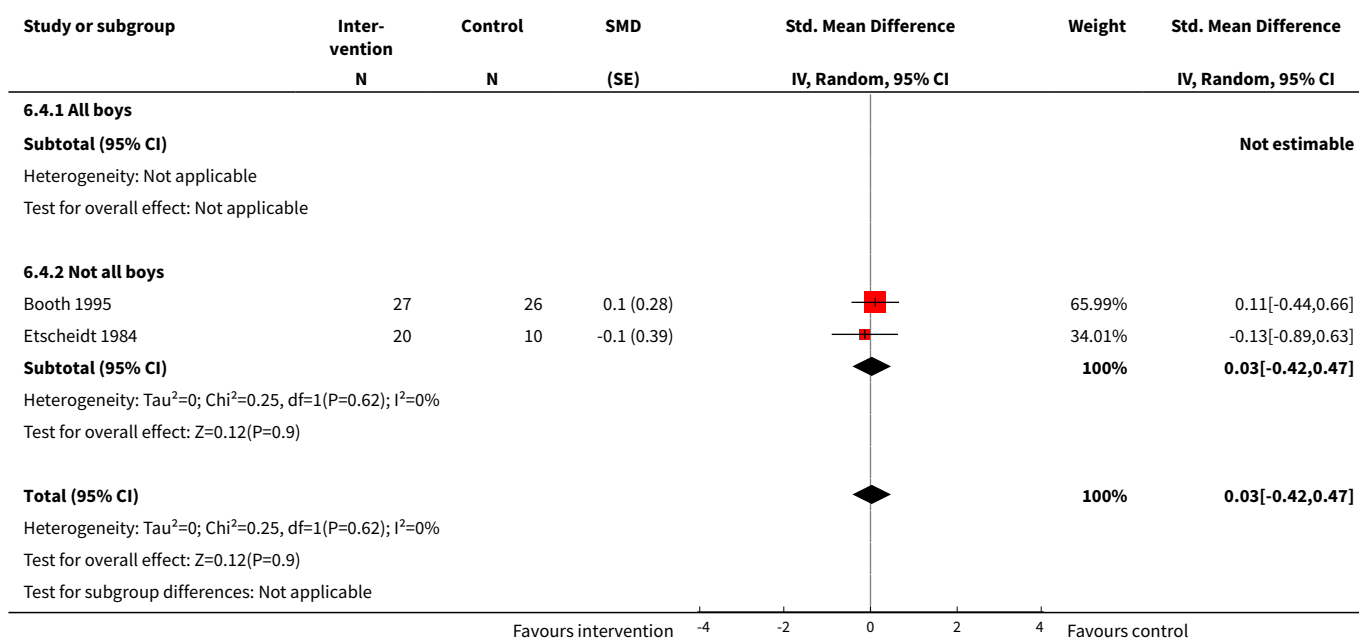
Analysis 6.2. Comparison 6 Anger/conflict response interventions versus no intervention by sex, Outcome 2 Difference in aggression scale score or observed violence by sex (up to 12 months).



Analysis 6.3. Comparison 6 Anger/conflict response interventions versus no intervention by sex, Outcome 3 Difference in school response to aggressive acts + other acts by sex (post test).



Analysis 6.4. Comparison 6 Anger/conflict response interventions versus no intervention by sex, Outcome 4 Difference in school response to aggressive acts + other acts by sex (up to 12 months).

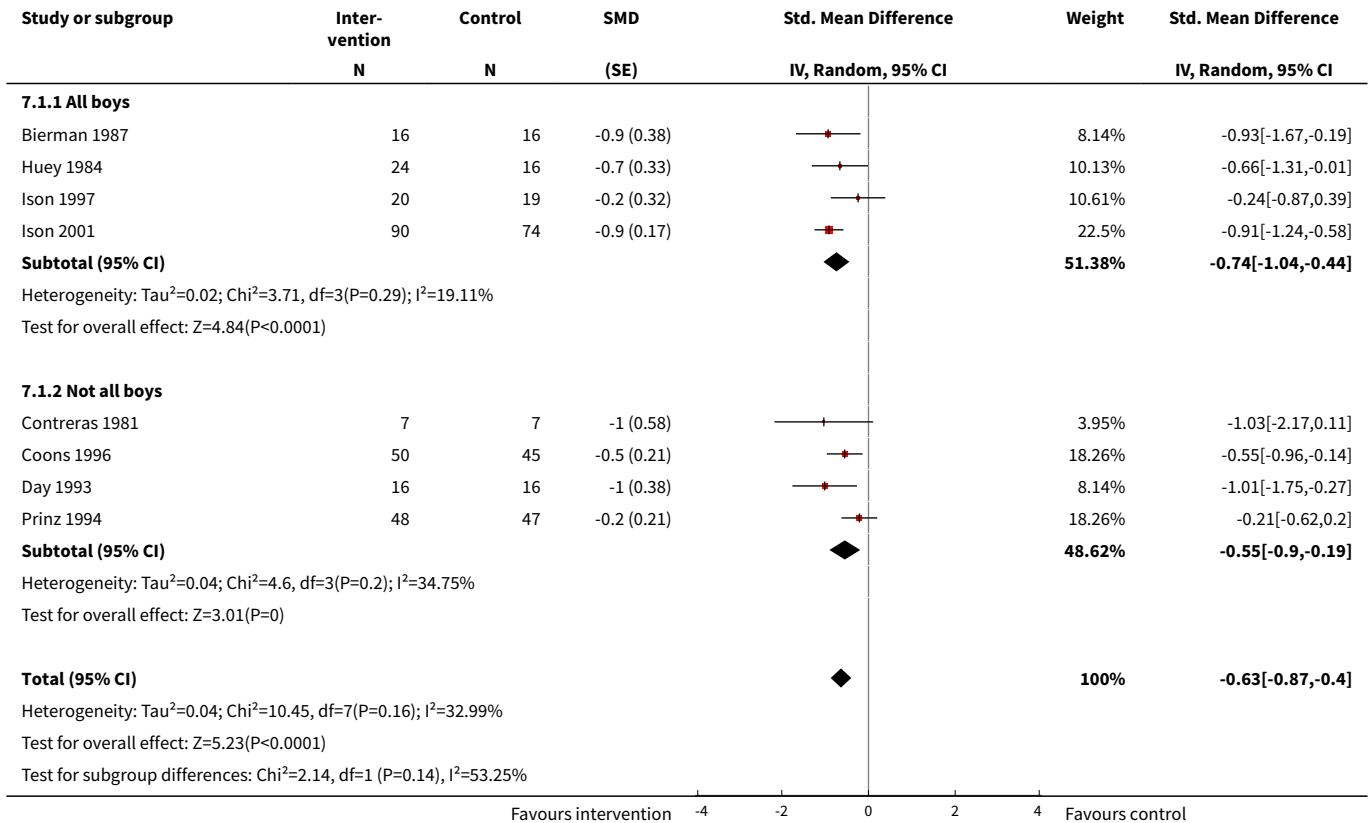


Comparison 7. Social skills & context interventions versus no intervention by sex

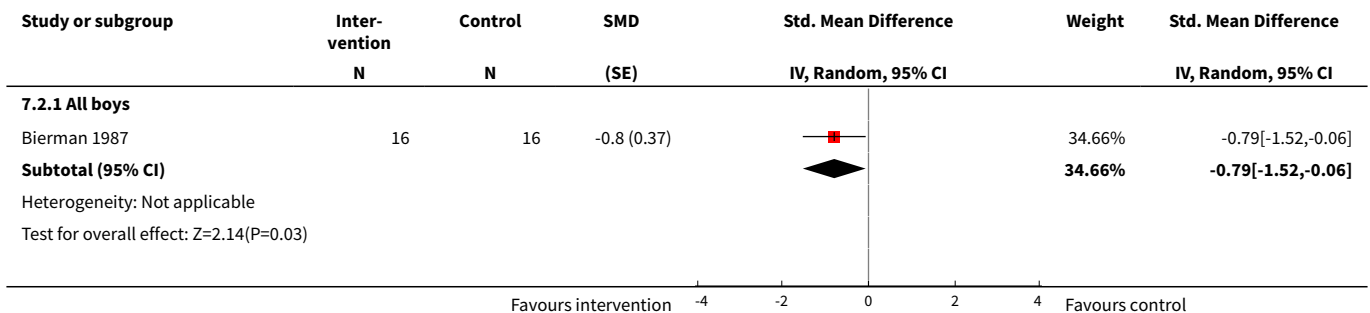
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression scale score or observed aggression by sex (post test)	8	511	SMD (Random, 95% CI)	-0.63 [-0.87, -0.40]
1.1 All boys	4	275	SMD (Random, 95% CI)	-0.74 [-1.04, -0.44]
1.2 Not all boys	4	236	SMD (Random, 95% CI)	-0.55 [-0.90, -0.19]
2 Difference in aggression scale score or observed aggression by sex (up to 12 months)	2	127	SMD (Random, 95% CI)	-0.43 [-0.94, 0.08]
2.1 All boys	1	32	SMD (Random, 95% CI)	-0.79 [-1.52, -0.06]
2.2 Not all boys	1	95	SMD (Random, 95% CI)	-0.24 [-0.65, 0.17]
3 Difference in school response to aggressive acts + other acts by sex (post test)	2	62	SMD (Random, 95% CI)	-0.28 [-1.65, 1.10]
3.1 All boys	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
3.2 Not all boys	2	62	SMD (Random, 95% CI)	-0.28 [-1.65, 1.10]
4 Difference in school response to aggressive acts + other acts by sex (up to 12 months)	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]

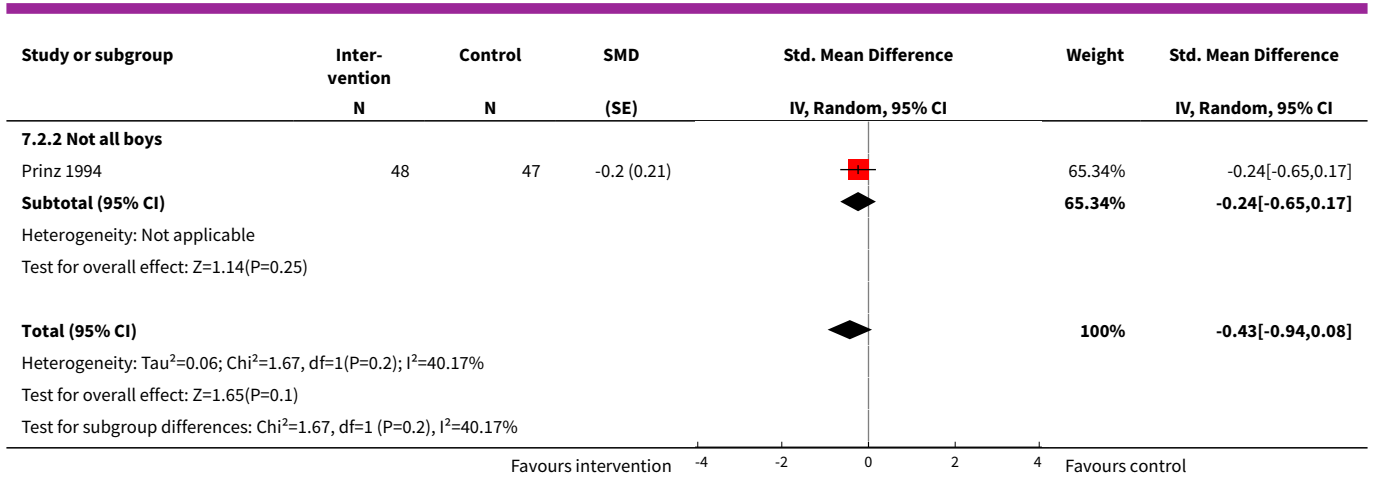
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4.1 All boys	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.2 Not all boys	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]

Analysis 7.1. Comparison 7 Social skills & context interventions versus no intervention by sex, Outcome 1 Difference in aggression scale score or observed aggression by sex (post test).

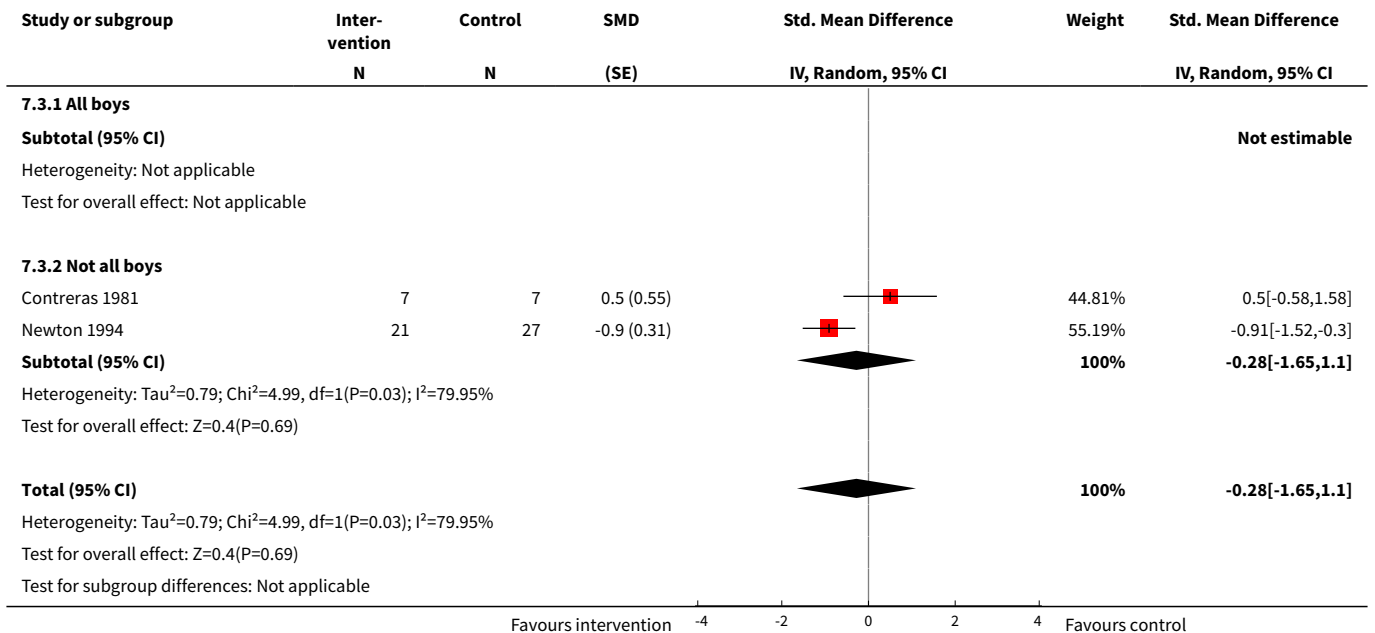


Analysis 7.2. Comparison 7 Social skills & context interventions versus no intervention by sex, Outcome 2 Difference in aggression scale score or observed aggression by sex (up to 12 months).





Analysis 7.3. Comparison 7 Social skills & context interventions versus no intervention by sex, Outcome 3 Difference in school response to aggressive acts + other acts by sex (post test).

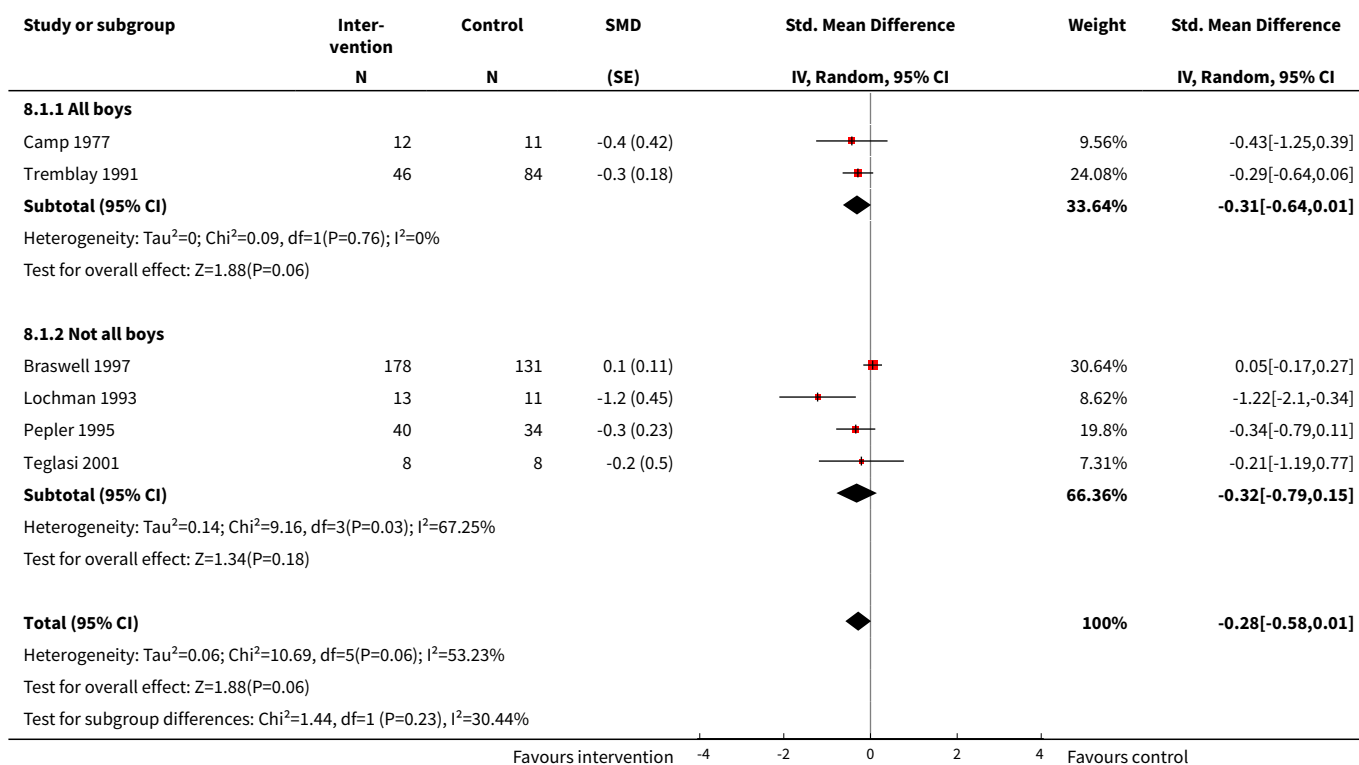


Comparison 8. Combined anger response & social skills interventions versus no intervention by sex

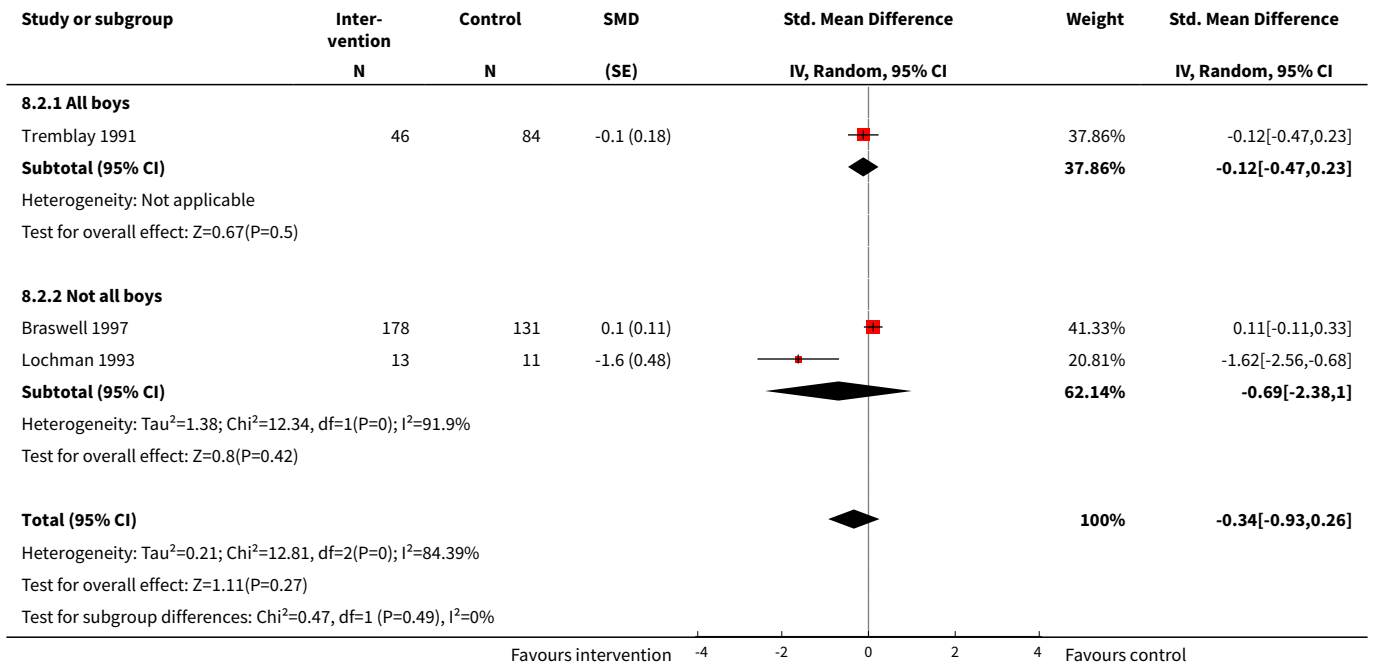
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression scale score or observed aggression by sex (post test)	6	576	SMD (Random, 95% CI)	-0.28 [-0.58, 0.01]
1.1 All boys	2	153	SMD (Random, 95% CI)	-0.31 [-0.64, 0.01]
1.2 Not all boys	4	423	SMD (Random, 95% CI)	-0.32 [-0.79, 0.15]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2 Difference in aggression scale score or observed aggression by sex (up to 12 months)	3	463	SMD (Random, 95% CI)	-0.34 [-0.93, 0.26]
2.1 All boys	1	130	SMD (Random, 95% CI)	-0.12 [-0.47, 0.23]
2.2 Not all boys	2	333	SMD (Random, 95% CI)	-0.69 [-2.38, 1.00]
3 Difference in school response to aggressive acts + other acts by sex (post test)	1	480	SMD (Random, 95% CI)	-1.95 [-2.19, -1.71]
3.1 All boys	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
3.2 Not all boys	1	480	SMD (Random, 95% CI)	-1.95 [-2.19, -1.71]
4 Difference in school response to aggressive acts + other acts by sex (up to 12 months)	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.1 All boys	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]
4.2 Not all boys	0	0	SMD (Random, 95% CI)	0.0 [0.0, 0.0]

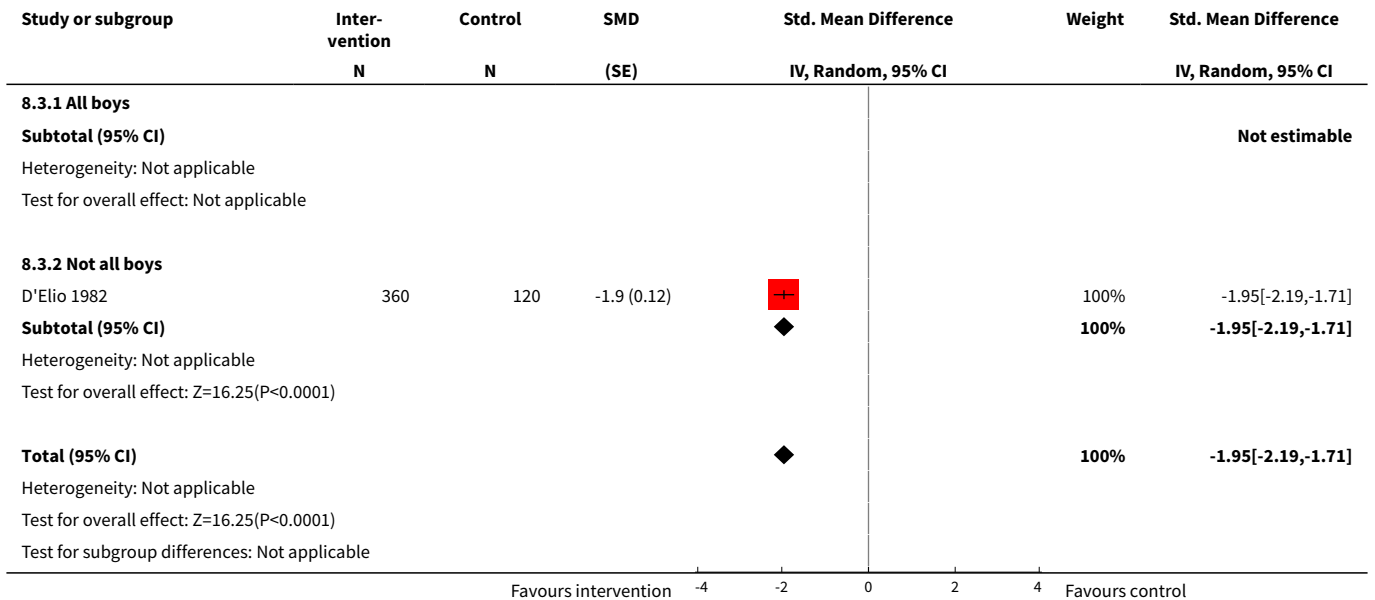
Analysis 8.1. Comparison 8 Combined anger response & social skills interventions versus no intervention by sex, Outcome 1 Difference in aggression scale score or observed aggression by sex (post test).



Analysis 8.2. Comparison 8 Combined anger response & social skills interventions versus no intervention by sex, Outcome 2 Difference in aggression scale score or observed aggression by sex (up to 12 months).



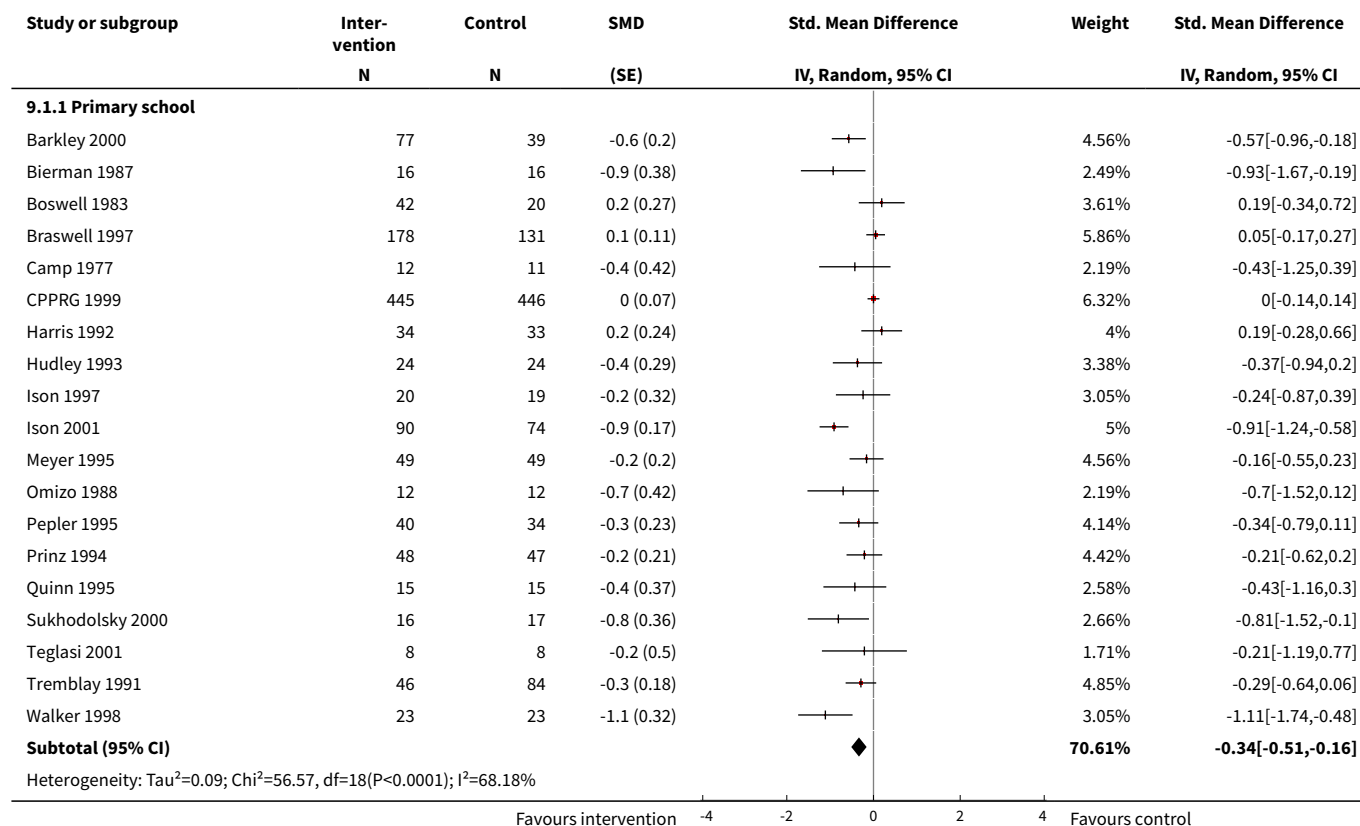
Analysis 8.3. Comparison 8 Combined anger response & social skills interventions versus no intervention by sex, Outcome 3 Difference in school response to aggressive acts + other acts by sex (post test).

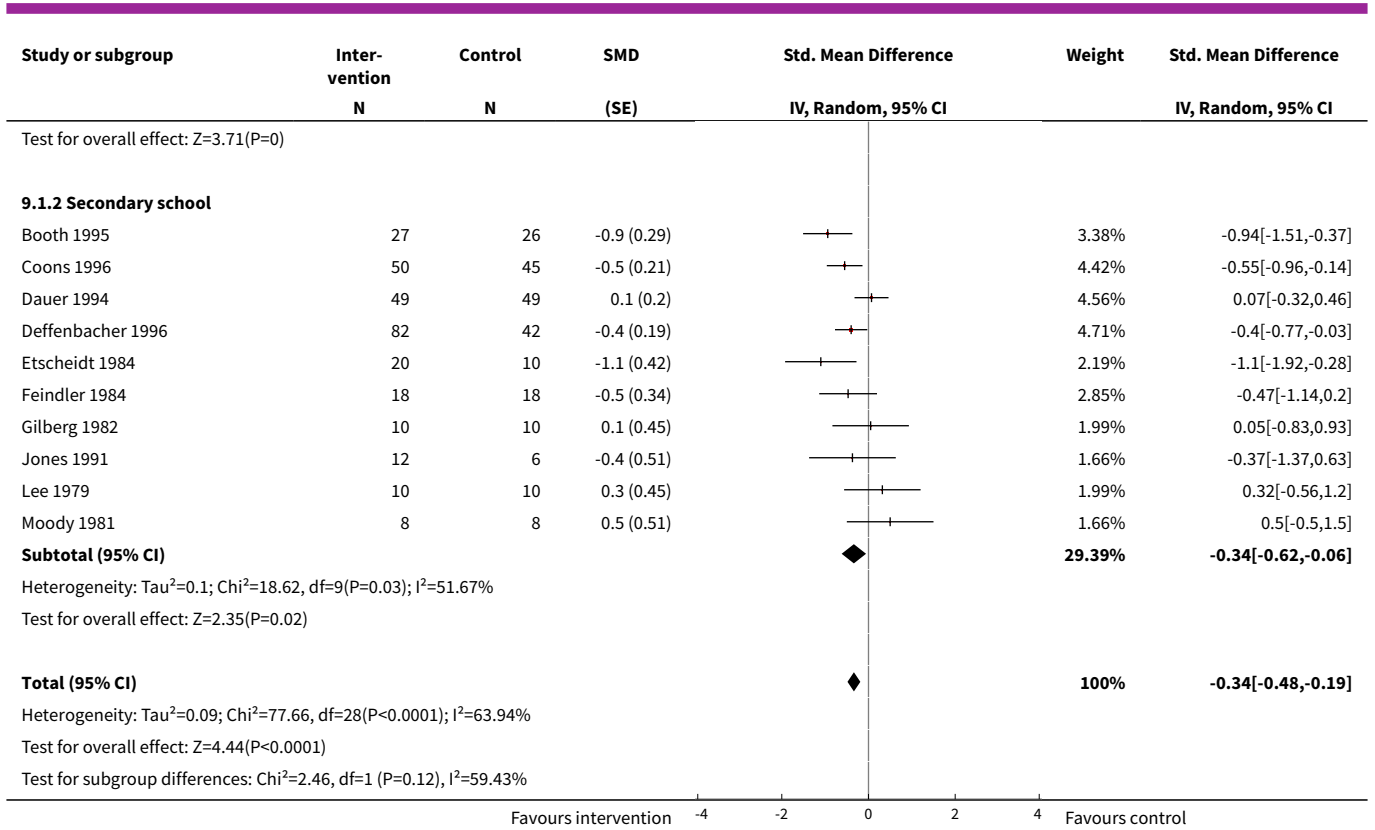


Comparison 9. Any intervention versus no intervention with and without imputed standard deviations

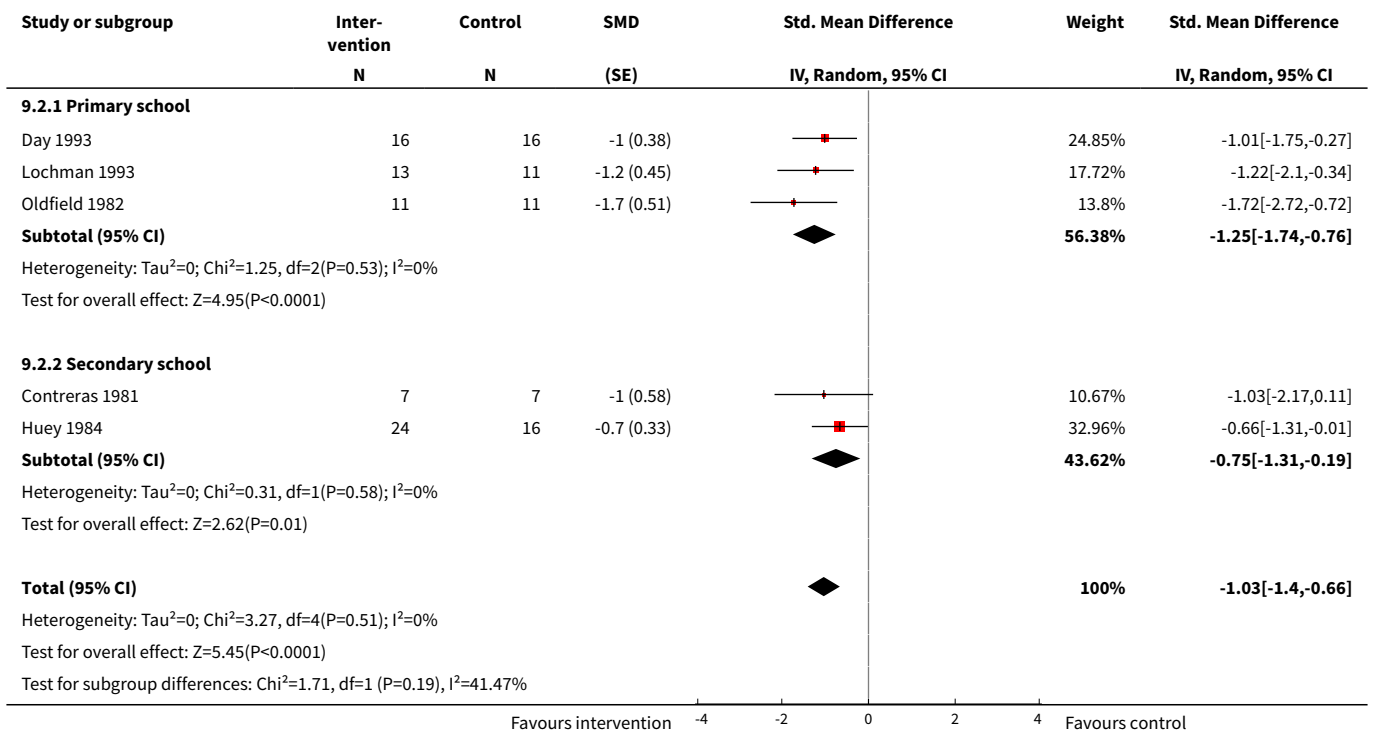
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression (score or observed) by type of school without imputed SDs	29	2807	SMD (Random, 95% CI)	-0.34 [-0.48, -0.19]
1.1 Primary school	19	2297	SMD (Random, 95% CI)	-0.34 [-0.51, -0.16]
1.2 Secondary school	10	510	SMD (Random, 95% CI)	-0.34 [-0.62, -0.06]
2 Difference in aggression (score or observed) by type of school - imputed SDs only	5	132	SMD (Random, 95% CI)	-1.03 [-1.40, -0.66]
2.1 Primary school	3	78	SMD (Random, 95% CI)	-1.25 [-1.74, -0.76]
2.2 Secondary school	2	54	SMD (Random, 95% CI)	-0.75 [-1.31, -0.19]

Analysis 9.1. Comparison 9 Any intervention versus no intervention with and without imputed standard deviations, Outcome 1 Difference in aggression (score or observed) by type of school without imputed SDs.





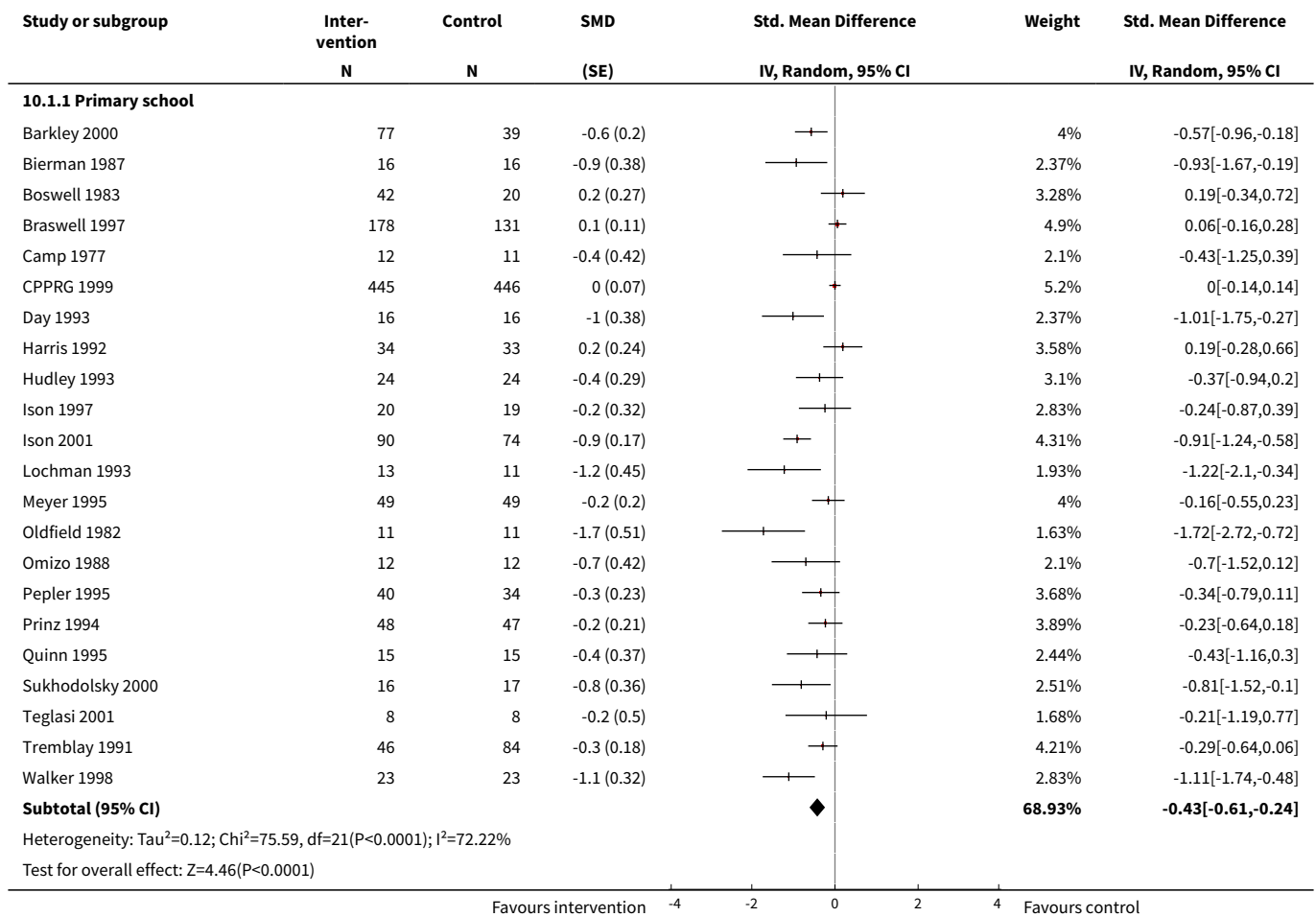
Analysis 9.2. Comparison 9 Any intervention versus no intervention with and without imputed standard deviations, Outcome 2 Difference in aggression (score or observed) by type of school - imputed SDs only.

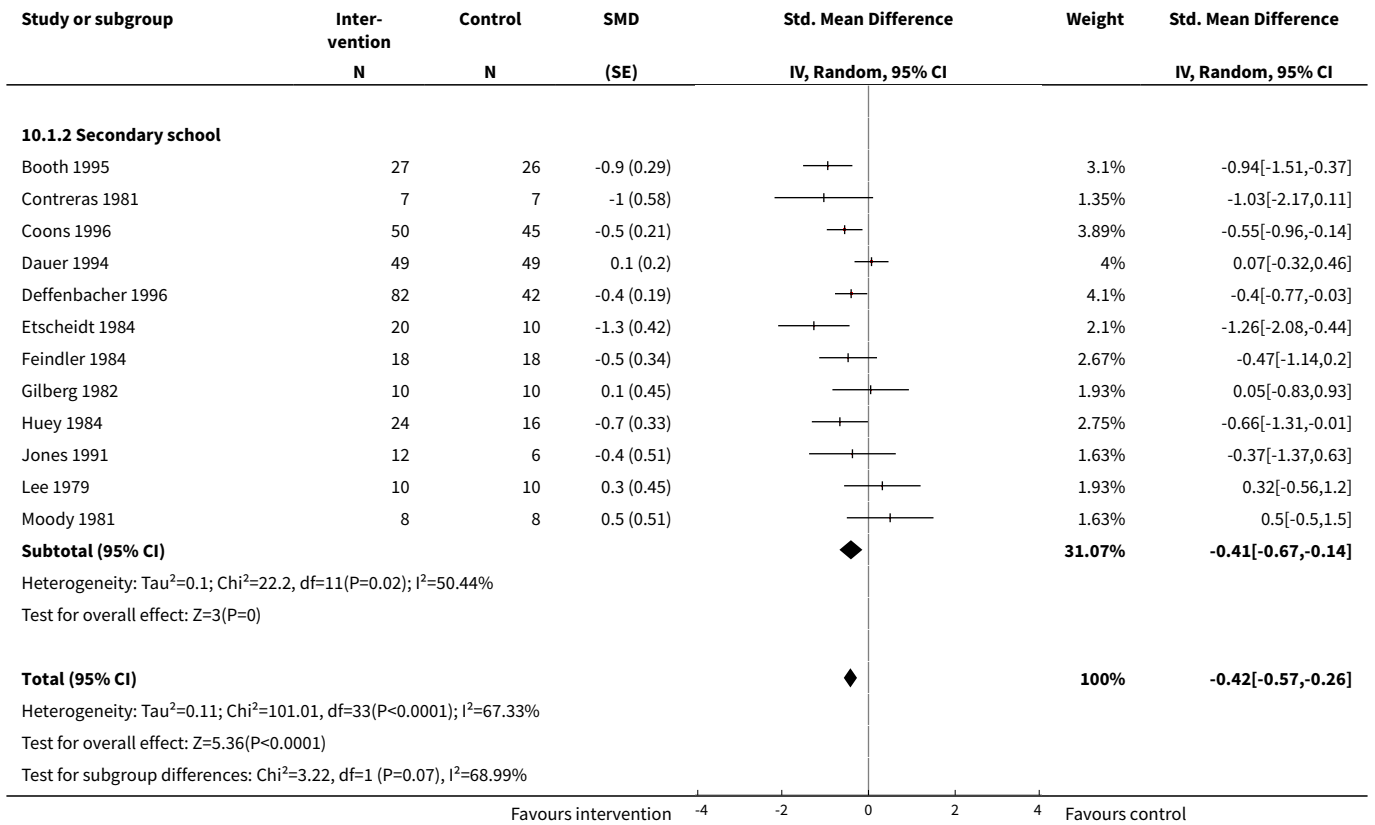


Comparison 10. Any intervention versus no intervention sensitivity analysis for cluster adjustments

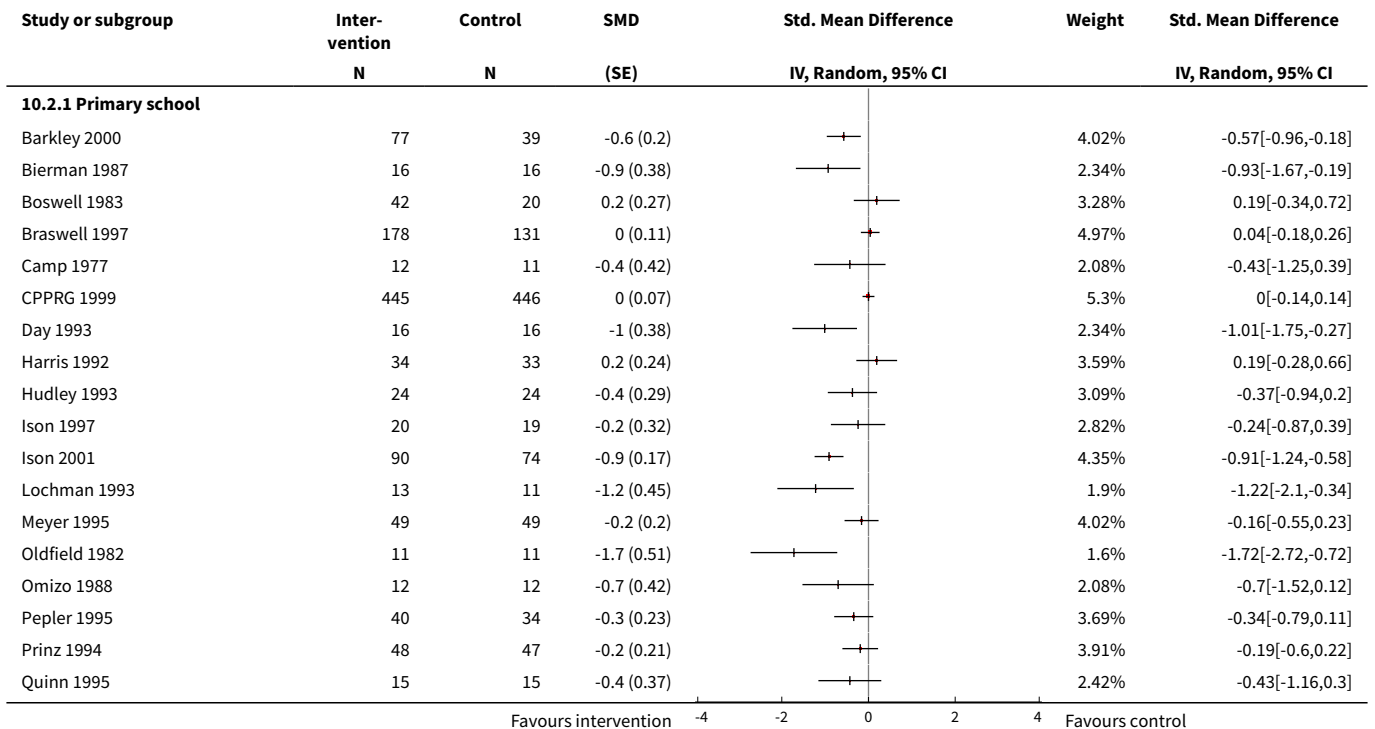
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Difference in aggression (score or observed) by type of school - ICC=0.1	34	2939	SMD (Random, 95% CI)	-0.42 [-0.57, -0.26]
1.1 Primary school	22	2375	SMD (Random, 95% CI)	-0.43 [-0.61, -0.24]
1.2 Secondary school	12	564	SMD (Random, 95% CI)	-0.41 [-0.67, -0.14]
2 Difference in aggression (score or observed) by type of school - ICC=0.2	34	2939	SMD (Random, 95% CI)	-0.41 [-0.56, -0.26]
2.1 Primary school	22	2375	SMD (Random, 95% CI)	-0.42 [-0.61, -0.24]
2.2 Secondary school	12	564	SMD (Random, 95% CI)	-0.39 [-0.64, -0.14]

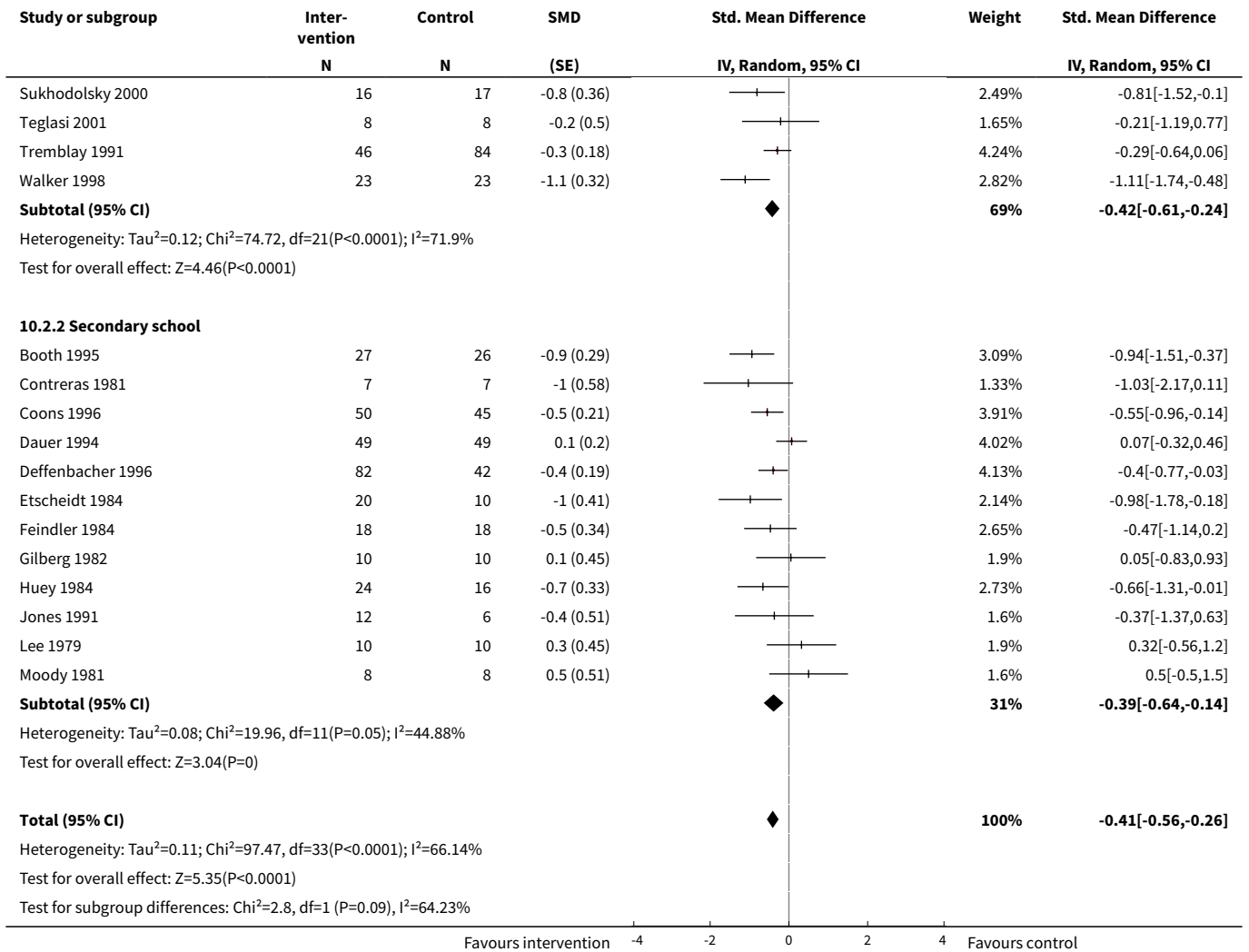
Analysis 10.1. Comparison 10 Any intervention versus no intervention sensitivity analysis for cluster adjustments, Outcome 1 Difference in aggression (score or observed) by type of school - ICC=0.1.





Analysis 10.2. Comparison 10 Any intervention versus no intervention sensitivity analysis for cluster adjustments, Outcome 2 Difference in aggression (score or observed) by type of school - ICC=0.2.

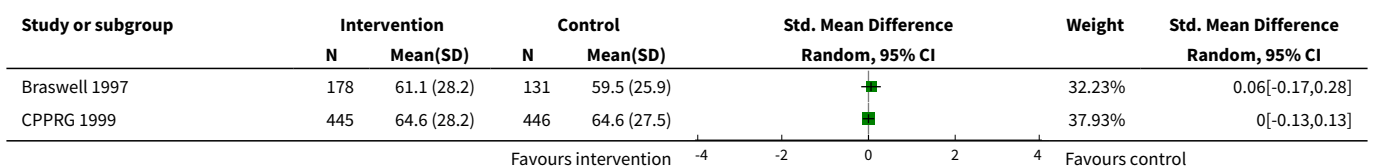


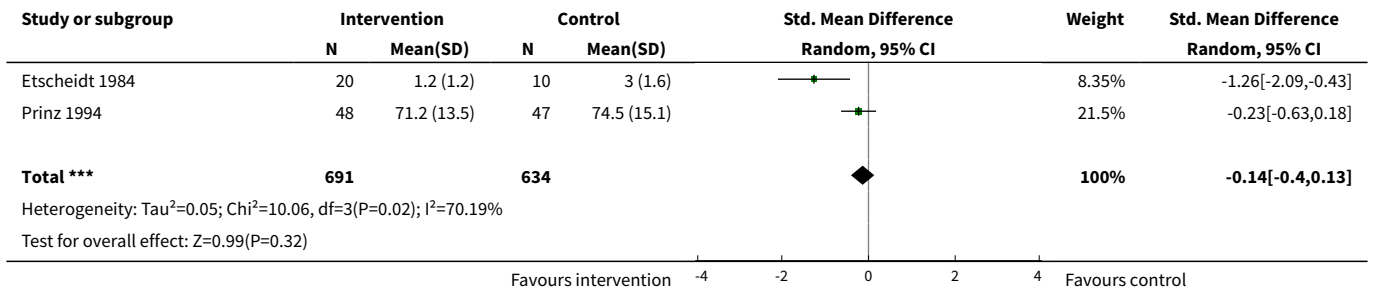


Comparison 11. Sensitivity analysis for cluster adjustments

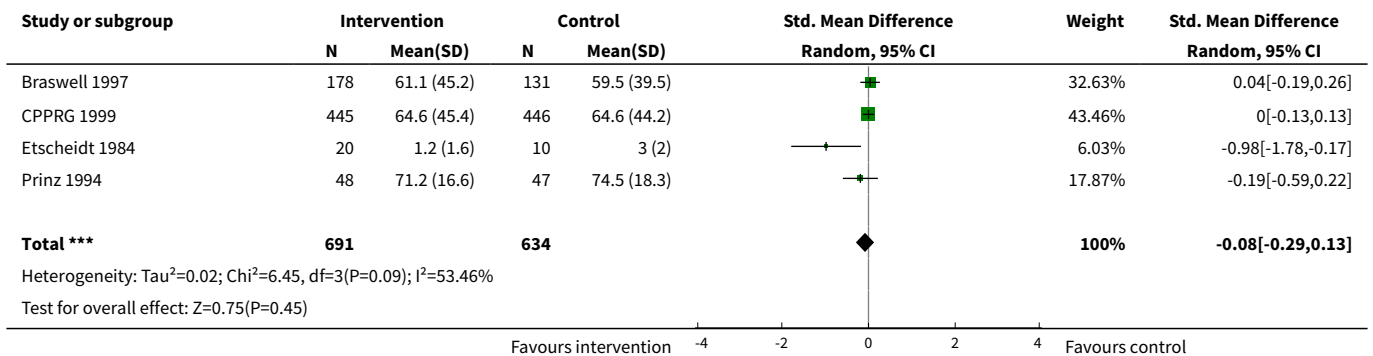
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 ICC=0.1	4	1325	Std. Mean Difference (IV, Random, 95% CI)	-0.14 [-0.40, 0.13]
2 ICC=0.2	4	1325	Std. Mean Difference (IV, Random, 95% CI)	-0.08 [-0.29, 0.13]

Analysis 11.1. Comparison 11 Sensitivity analysis for cluster adjustments, Outcome 1 ICC=0.1.





Analysis 11.2. Comparison 11 Sensitivity analysis for cluster adjustments, Outcome 2 ICC=0.2.



APPENDICES

Appendix 1. Search strategy

The searches were based on the following **MEDLINE** strategy:

- 1."VIOLENCE"/ all subheadings
- 2."DANGEROUS-BEHAVIOR"
- 3."AGGRESSION"/ all subheadings
- 4."HOSTILITY"/ all subheadings
- 5."FIREARMS"/ all subheadings
- 6."SUICIDE"/ all subheadings
- 7."SUICIDE,-ATTEMPTED"/ all subheadings
- 8."RAPE"/ all subheadings
- 9."CRIME-VICTIMS"/ all subheadings
- 10."JUVENILE-DELINQUENCY" / all subheadings
- 11.violen* or aggress* or angry or hostil* or bully* or bullie* or fight* or fought or firearm*
- 12.fire near arm*
- 13.suicid* or homicid* or conflict* or resol* or mediation
- 14.conflict* near (resol* or mediation)
- 15.(antisocial or agonis*) near behavi*
- 16.weapon* or knife or knives or gun or guns or assault* or anger or delinquen*
- 17.#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16
- 18."SCHOOL-HEALTH-SERVICES"/ all subheadings
- 19."SCHOOLS"/ all subheadings
- 20."EDUCATION"/ all subheadings
- 21.explode "CURRICULUM"/ all subheadings
- 22.explode "TEACHING"/ all subheadings
- 23."HEALTH-EDUCATION"/ all subheadings

- 24."MENTORS"/ all subheadings
 25."STUDENT-DROPOUTS"/ all subheadings
 26."STUDENTS"/ all subheadings
 27.school* or high-school or educat*or student* or "peer-group" or peer or peers or curricul* or teach* or mentor*
 28.#18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27
 29.#17 AND #28
 30."CHILD-"/ all subheadings
 31."ADOLESCENCE"/ all subheadings
 32."CHILD,-PRESCHOOL"/ all subheadings
 33.#30 or #31 or #32
 34."ADULT"/ all subheadings
 35."MIDDLE-AGE"/ all subheadings
 36."AGED"/ all subheadings
 37."AGED,-80-AND-OVER"/ all subheadings
 38."INFANT-"
 39."INFANT,-NEWBORN"/ all subheadings
 40.#34 or #35 or #36 or #37 or #38 or #39
 41.#33 AND #40
 42.#40 NOT #41
 43.#33 NOT #42
 44.#29 AND #43

WHAT'S NEW

Date	Event	Description
27 July 2009	Amended	Some references have been amended.

HISTORY

Protocol first published: Issue 1, 2004
 Review first published: Issue 3, 2006

Date	Event	Description
11 September 2008	Amended	Converted to new review format.

CONTRIBUTIONS OF AUTHORS

Julie Mytton co-ordinated the review, was involved in the design of the study and the search strategy, undertook searches, screened search results, appraised the quality of studies, contacted authors, extracted data, entered data to RevMan, analysed and interpreted data and wrote the review.

Carolyn DiGuseppi was involved in the conception and design of the study, the development of the search strategy, undertook searches, screened search results, appraised the quality of studies, contacted authors, extracted data, contributed to analysis and interpretation of data, and to the drafting and final approval of the text of the review.

David Gough was involved in the screening of papers for inclusion in the study, appraisal of study quality, extraction of data, interpretation of data, and contributed to the drafting and final approval of the text of the review.

Rod Taylor was involved in the analysis of data, provided a methodological perspective on the interpretation of data, and contributed to the drafting and final approval of the text of the review.

Stuart Logan was involved in the conception and design of the study, the interpretation of the data, and contributed to the drafting and final approval of the text of the review.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- (JM) Systematic Reviews Training Unit, Institute of Child Health, London, UK.

External sources

- (CD) Camden and Islington Health Authority, London, UK.
- (CD) US Agency for Healthcare Quality and Research, USA.

NOTES

Earlier analyses of these data have been reported in:

Mytton JA, DiGuseppi C, Gough DA, Taylor RS and Logan S

School based violence prevention programs: Systematic review of secondary prevention trials. Archives of Pediatrics and Adolescent Medicine 2002;156:752-62.

DiGuseppi C, Mytton JA, Gough DA, Taylor RS and Logan S

School based violence prevention programs: Systematic review of secondary prevention trials. Report prepared for the Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services, Rockville, Maryland, June 30, 2003.

INDEX TERMS

Medical Subject Headings (MeSH)

*Program Evaluation; *Schools; Adolescent Behavior; Aggression [*psychology]; Randomized Controlled Trials as Topic; Social Behavior; Violence [*prevention & control]

MeSH check words

Adolescent; Child; Humans