A Systematic Review and Meta-Analysis of Teacher-Implemented Interventions for Disruptive Behaviour in the Inclusive Classroom

Matt Orr[1], Jason Isaacs[2], Alzena Ilie[2], Christine T. Chambers[2,3], Isabel M. Smith[2,3] & Penny Corkum[2,3,4]

[1] Department of Psychology, Acadia University, Wolfville, Nova Scotia, Canada

[2] Department of Psychology and Neuroscience, Dalhousie University, Halifax, Nova Scotia, Canada

[3] Department of Pediatrics, Dalhousie University, Halifax, Nova Scotia, Canada

[4] ADHD Clinic, Colchester Regional Hospital, Colchester, Nova Scotia, Canada

Correspondence: Penny Corkum, Professor, Department of Psychology and Neuroscience, Room 2521, 1355 Oxford St., Halifax, NS B3H 4R2, Canada. E-mail: Penny.Corkum@dal.ca

Abstract

Disruptive classroom behaviour (DCB) is highly prevalent and is associated with poor outcomes. Although effective, in-class interventions exist for disruptive behaviour, several barriers prevent teachers from using them. The current systematic review and meta-analysis take a unique approach to the literature by focusing on teacher-implemented in-class interventions. The aims of the systematic review and meta-analysis are to (a) to identify studies that evaluated teacher-implemented in-class interventions for DCB in the extant literature, (b) extract characteristics of the interventions related to implementation (e.g., time commitment, training required), and (c) estimate an overall effect size of the interventions on DCB. A systematic review, conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement, identified 45 articles included in the final review, of which 27 were included in the meta-analysis. Intervention characteristics were summarized for the 28 identified interventions. The combined effect size of the studies was positive and large when estimated using a random-effects model. The results suggest that while there is evidence for the effectiveness of these interventions, the poor methodological quality of the included studies may inflate the effectiveness. These results also suggest future directions for research regarding teacher-implemented in-class interventions for DCB.

Keywords: classroom teachers, disruptive classroom behaviour, interventions, meta-analysis, systematic review

1. Introduction

Children's disruptive classroom behaviour (DCB) is characterized by off-task behaviour, non-compliance with teacher requests, and aggressive behaviour (Schaeffer et al., 2006; Yoder & Williford, 2019). Based on reviews of student school records in Grades 1-12 in the United States of America, approximately 40%-55% of students have recorded incidents of disruptive behaviour (Kaufman et al., 2010; Skiba et al., 1997; Wright & Dusek, 1998). Students who display chronic DCB are at greater risk for impaired social relationships and poor academic and post-school outcomes (McDaniel et al., 2017). Disruptive classroom behaviour can also negatively affect the learning process of all students by reducing the time for instruction (Luiselli et al., 2002). Teachers have also reported that DCB increases work-related stress and decreases their own overall well-being (Klassen & Chiu, 2010). For these reasons, it is optimal for teachers to have access to evidence-based interventions (EBIs) to effectively manage DCB (Klassen & Chiu, 2010).

Although there are EBIs for DCB, most are provided to students who have a formal diagnosis of a psychological disorder (e.g., autism spectrum disorder, attention-deficit/hyperactivity disorder, oppositional defiant disorder; Mental Health Commission of Canada, 2013). These interventions typically involve the use of functional behaviour assessment (FBA) to assess the antecedents (i.e., preceding events) and consequences (i.e., subsequent events) that provoke and support unwanted behaviours (Canadian Psychological Association, 2007; 2014). However, many students display DCB that have not been formally diagnosed, some of whom may meet diagnostic criteria and others who do not meet diagnostic criteria but display DCB (Charlton et al., 2017; Kaufman et al., 2010). The existence of this continuum of disruptive behaviour, and the lack of intervention services for those students who are not diagnosed with a disruptive behaviour disorder, suggests a need for EBIs for DCB for

students who do not have formal diagnoses.

Previous meta-analyses and systematic reviews have summarized the extant literature assessing school-based interventions for disruptive behaviour in a mainstream classroom setting. Most of these studies have focused on specific types of interventions, such as positive behaviour support (Lee & Gage, 2020), classroom seating (Rollo et al., 2018), mindfulness (Klingbeil et al., 2017), peer management (Chaffee et al., 2017; Dart et al., 2014), academic interventions (i.e., altering academic practices to meet the needs of students; Warmbold-Brann et al., 2017), and token economies (Chaffee et al., 2017). In addition to these meta-analyses and systematic reviews focused on specific interventions, Wilson and Lipsey (2007) conducted a comprehensive meta-analysis of any school-based interventions for disruptive behaviour, finding that behavioural interventions consistently resulted in improvements in disruptive behaviour. Taken together, these studies suggest that school-based interventions can be effective at reducing the disruptive behaviour of students.

While there is strong support for the effectiveness of behavioural interventions for DCB, what is unknown is whether teachers can implement these interventions without additional support in their classrooms. Previous systematic reviews have included studies of interventions implemented anywhere within the school environment and by a range of people, including the classroom teacher, other school staff members, and researchers. Therefore, it is difficult to know whether the implementation of EBIs for DCB by classroom teachers is feasible and effective. Furthermore, these studies also seldom included specific details about intervention implementation beyond time commitments (i.e., number of intervention sessions; Dart et al., 2014; Klingbeil et al., 2017), further reducing the utility of their results.

The purpose of the current systematic review and meta-analysis was to determine what is known about teacher-implemented in-class interventions for DCB. Unlike previous meta-analyses and reviews, the current study focused on a specific intervention location (i.e., the inclusive classroom) and implementer (i.e., classroom teacher). Additionally, the current study summarizes specific information about intervention implementation that was not summarized in previous meta-analyses and reviews.

2. Methods

The Preferred Reporting Items for Systematic Review and Meta-analyses (PRISMA) statement (Page et al., 2021) informed the protocol for the current study.

2.1 Systematic Review

2.1.1 Information Sources and Search Strategy

Published studies were identified by searching three electronic databases (i.e., ERIC, EBSCOHost (PsycInfo), and PubMed) where educational and psychological research is aggregated. The search strategy consisted of four semantic groups (described below); the Boolean operator 'OR' concatenated terms within each group, and the Boolean operator 'AND' concatenated the four groups. The first group identified the target population (e.g., adolescen*, child*), the second group was related to the classroom setting (e.g., class-based, school delivered), the third group was related to interventions specifically (e.g., intervention, adaptation), and the fourth group was related to disruptive behaviour (e.g., disruptive behaviour, aggression). The search strategy was tailored for each database, with search terms mapped to Medical Subject Headings whenever possible. Searches were conducted in November 2018. Three updated searches were conducted in January 2020, 2021, and 2023.

2.1.2 Study Selection Criteria

The eligibility (inclusion and exclusion) criteria were derived using the Population Intervention Comparison Outcome (PICO) model to determine which populations, interventions, comparisons, and outcomes were relevant to the study goals (Schardt et al., 2007). The PICO model included school-age children as the population and teacher-implemented in-class interventions as the interventions. Comparisons of interest were those to baseline, waitlist control groups, treatment as usual, and/or another intervention or program. The outcomes of interest were behaviour, academic functioning, satisfaction (i.e., students, teachers), and teacher competence/confidence/knowledge.

Inclusion criteria were: (a) the intervention was implemented in the inclusive classroom setting during class time (as opposed to during recess, lunch, or after school), (b) inclusive classroom teachers implemented the intervention, and (c) the study was published in a peer-reviewed journal in English.

Exclusion criteria were: (a) all students within the study were outside the target age group (e.g., preschool, grade primary, university), (b) the article did not report original research (e.g., review), (c) the study was not focused on student outcomes (e.g., focused on teachers' behaviour change), (d) the study was not focused on the classroom

setting (e.g., focused on at-home behaviour, focused on behaviour during recess), and (e) no intervention was implemented, or no quantitative results were provided.

Duplicate articles were removed first, followed by the title and abstract reviews such that any articles that met the exclusion criteria were removed. A full-text review followed title and abstract reviews to determine eligible studies. Studies were kept after the full-text review if they met the inclusion criteria.

2.1.3 Data Extraction

Data extraction was conducted independently by three authors (MO, JI, and AI), using an author-created form. Any noted inconsistencies were discussed between the two authors and, if necessary, were discussed with a third author (PC) and settled. The categories used for data extraction were: (a) country in which the intervention was implemented; (b) the number of participants; (c) ages of participants; (d) sex of participants; (e) who implemented the intervention; (f) description of training provided to the implementer; (g) length of intervention; (h) timing of follow-up or maintenance measures post-intervention; (i) type of study design; (j) how targeted behaviour change was assessed/measured; and (k) evidence of success (i.e., for, mixed, none, or against).

2.1.4 Quality Assessment

All studies included in the systematic review were rated in terms of their methodological quality using the checklist developed by Downs and Black (1998), which allows for assessing the quality of randomized and non-randomized studies. Studies could receive scores between 0 (i.e., very poor methodological quality) and 27 (i.e., very high methodological quality). The checklist has a high internal consistency (Kuder–Richardson-20: 0.89), high test-retest reliability ($r = 0.88$), and good inter-rater reliability ($r = 0.75$; Downs & Black, 1998).

2.2 Meta-Analysis

The reported effect and sample sizes were extracted from each reviewed article to conduct the meta-analysis. As suggested by Field (2013), Pearson's r was chosen for the combined effect size. If effect sizes were not reported, corresponding authors were contacted to retrieve either the effect size calculation itself or raw data to calculate the effect size. For studies that reported effect sizes other than Pearson's r (e.g., NAP, Tau-U, Cohen's d), the appropriate conversion formula was used to derive an estimated value of Pearson's r from the reported effect size (Parker & Vannest, 2009; Parker et al., 2011). As suggested by Field (2013), articles that reported multiple effect sizes without one effect size identified as a primary outcome (e.g., five outcome measures, each with an associated effect size) were represented by multiple data points in the meta-analysis, one for each unique effect size reported that was relevant to disruptive behaviour (e.g., externalizing problems). Based on previous meta-analyses and reviews, the articles included in the current meta-analysis were expected to be quite heterogeneous in terms of the variety of interventions being assessed. Therefore, a Hedges-Vevea random-effects model (Hedges & Vevea, 1998) was used. The analysis was conducted using IBM SPSS 25, using Field and Gillett's (2010) meta-analysis syntax.

3. Results

3.1 Systematic Review

A PRISMA (Liberati et al., 2009) flow diagram outlines the breakdown of the article selection process (Figure 1). The initial search was run in 2018 and was re-run in 2021. The results presented in this study are based on the results of the search from 2023. General information about the articles is summarized in Tables 1 and 2 and discussed below.
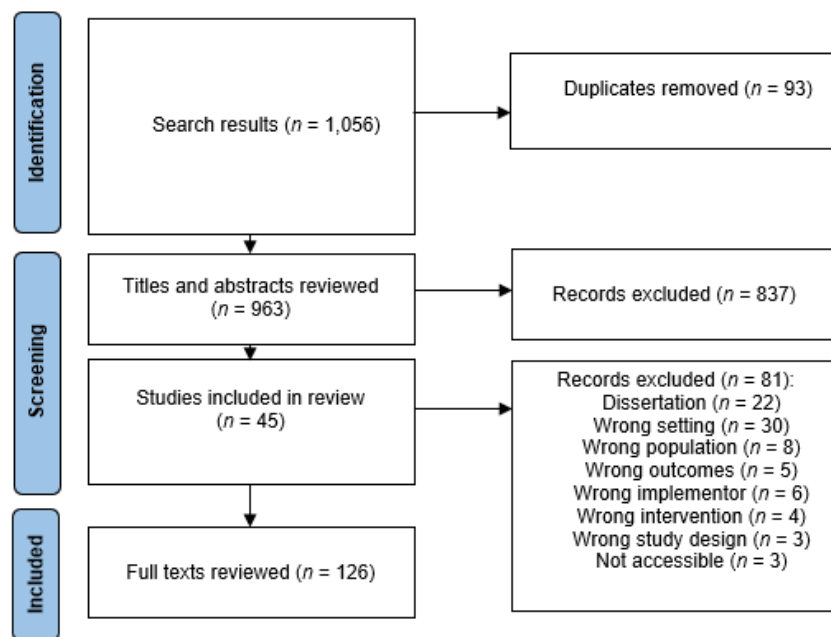
Figure 1. PRISMA Diagram

3.1.1 Participants

Most of the 45 reviewed studies were conducted in the United States of America (n = 37) and the remaining studies were conducted in Australia ($n = 1$), Finland ($n = 1$), Ireland ($n = 1$), the Netherlands ($n = 1$), Spain ($n = 2$), Taiwan ($n = 1$), and the United Kingdom ($n = 1$). The sample sizes for the included studies ranged from 1 to 5611 ($M = 575.80$). The participants represented students from kindergarten to grade 12, with reported ages of 6-20 years. Of the studies that reported the sex distribution within their samples ($n = 41$), the proportion of male participants ranged from 33% to 100%, with an average of 62%. Please see Table 1 for additional information.

Table 1. Data Extracted from Included Studies

Reference	Country	Sex	Grade/Age	Implementer
Blair et al., 2018	USA	365 m, 350 f	5 years	CT
Bohan et al. 2021	IE	11 m, 10 f	12-14 years	CT
Buchanan et al. 2021	USA	11 m, 10 f	grade 1	CT
Bruhn et al., 2017	USA	2 m, 1 f	grades 6-7	CT
Bulla et al., 2017	USA	2 m	grade 6	CT
Caldarella et al., 2018	USA	255 m, 95 f	grades PK-6	CT
Canfield et al., 2021	USA	3 m	6-9 years	CT
Chen et al., 2018	USA	2 m, 1 f	5-6 years	CT
Clair et al., 2017	USA	3 m, 1 f	8 years	CT
Collins et al., 2017	USA	12 m, 3 f	grades 9-12	CT
Cook et al., 2017	USA	81 m, 78 f	grades 4-5	CT
Coombes et al., 2016	UK	222	5-7 years	CT
Daunic et al., 2019	USA	2079	N/A	CT
Duong et al., 2018	USA	190	middle school	CT

Eaves et al., 2020	USA	47 m, 50 f	grade 3	CT
Eaves et al., 2021	USA	48 m, 49 f	grades K-1	CT
Gettinger et al., 2021	USA	4 m, 2 f	grade 2	CT
Goodnight et al., 2021	USA	3 m, 2 m	9-10 years	CT
Hai et al., 2021	USA	6 m, 5 f	10-11 years	CT
Harry et al., 2022	USA	41 m, 30 f	grades 9-11	CT
Holdaway et al., 2020	USA	29 m, 8 f	grades K-5	CT
Ialongo et al., 2019	USA	2805 m, 2805 f	elementary school	CT
Kumm et al., 2021	USA	4 m	15-17 years	CT
Lastrapes et al., 2018	USA	11 m, 4 f	grades 4-5	CT
Lee et al., 2017	USA	N/A	grades 5-6	CT
Lin et al., 2022	USA	120 m, 130 f	11 years	CT
Lombas et al., 2019	ES	262 m, 262 f	elementary school	CT
Lynne et al., 2017	USA	344 m, 328 f	grades k-12	CT
MacDonald et al., 2018	AUS	4 m	8-11 years	CT
McHugh et al., 2016	USA	29 m, 35 f	Grades 2-3	CT; S
Närhi et al., 2017	FI	N/A	grades 7-8	CT
Naylor et al., 2018	USA	2 m, 1 f	6 years	CT
O'Handley et al., 2020	USA	54 m, 35 f	7-8 years	CT
Reinke et al., 2018	USA	908 m, 908 f	elementary school	CT
Reinke et al., 2021	USA	N/A	Grades K-3	CT
Schulz et al., 2020	USA	3 m, 1 f	6-7 years	CT
Schulz et al., 2022	USA	3 m, 1 f	6-7 years	CT
Sheridan et al., 2017	USA	203 m, 64 f	grade k-3	CT
Thomas et al., 2020	USA	22 m, 18 f	grade 3	CT
Tur-Porcar et al., 2021	ES	308 m, 247 f	9-12 years	CT
Tolan et al., 2020	USA	N/A	grades K-3	CT
Van den berg et al., 2018	NL	773 m, 762 f	10 years	CT
Vargo et al., 2019	USA	13 m	13-14 years	CT
Wills et al., 2021	USA	60 m, 10 f	11-14 years	CT
Wu et al., 2019	TW	1 m	grade 5	CT

Note. Under "participants" are listed details about sex and age for the participants from the study meeting inclusion criteria.

Country: AUS = Australia, ES = Spain, FI = Finland, IE = Ireland, NL = Netherlands, TW = Taiwan, UK = United Kingdom, USA = United States of America

Implementer: CT = classroom teacher, S = student

Design: CS = case study, PP = pre-post, RCT = randomized controlled trial, SS = single-subject.

3.1.2 Studies

A variety of research designs were used: pre-post design ($n = 13$), single-subject designs ($n = 12$), randomized controlled trials ($n = 12$). Most studies used only in-class observation to measure student behaviour ($n = 28$), with some studies using only teacher reports (i.e., questionnaires, surveys; $n = 8$), and two using only students' reports (i.e., questionnaires, academic work, surveys; $n = 2$). Four studies used a combination of in-class observation and teacher reports and three used a combination of teacher and student reports. Finally, all included studies found evidence to support the effectiveness of the intervention of study at the initial outcome measure post-intervention.

Some of the included studies also reported follow-up measures after the study period ($n = 15$), with follow-up measure intervals ranging from immediately following the intervention to one year following the end of the intervention. All follow-up assessments found evidence to support the effectiveness of the intervention of study. Please see table 2 for additional information.

Table 2. Data Extracted from Included Studies (cont'd)

Reference	Training	Length	Follow-up	Design	Measures	Evidence
Blair et al., 2018	5 days	2 school years	2 months	RCT	TR	+
Bohan et al., 2021	35-minute session	N/A	N/A	SS	CO	+
Buchanan et al., 2021	N/A	9 months	N/A	SS	CO	+
Bruhn et al., 2017	30-minute session	10-13 lessons	N/A	SS	CO	+
Bulla et al., 2017	30-minute session	24-27 school days	N/A	SS	CO	+
Caldarella et al., 2018	2-hour session	4 months	4-month	RCT	TR	+
Canfield et al., 2021	15-minute session	N/A	1-week	SS	CO	+
Chen et al., 2018	1-day, weekly supervision	1 30-minute session a week for 6 weeks	N/A	SS	CO	+
Clair et al., 2017	2 days, training manual	1 month	N/A	SS	CO	+
Collins et al., 2017	20-minute session	30-45 lessons	N/A	SS	CO	+
Cook et al., 2017	2 45-minute sessions	N/A	N/A	PP	CO	+
Coombes et al., 2016	2 days	1 school year	N/A	PP	TR	+
Daunic et al., 2019	2 days	27 lessons	12-month, 24-month	PP	TR	+
Duong et al., 2018	3-hour session	N/A	N/A	RCT	CO	+
Eaves et al., 2020	30 minutes	N/A	N/A	SS	CO	+
Eaves et al., 2021	30 minutes	N/A	N/A	PP	CO	+
Gettinger et al., 2021	60 minutes	6-8 weeks	N/A	SS	CO	+
Goodnight et al., 2021	30 minutes	16 days	N/A	SS	CO	+
Hai et al., 2021	N/A	15 days	Six sessions	SS	CO	+
Harry et al., 2021	30 minutes	3 days	N/A	SS	CO	+
Holdaway et al., 2020	30-60 minutes	1 month	2, 3, and 4 months	RCT	CO, TR	+
Ialongo et al., 2019	1.5 days	1 school year	6-month	RCT	CO, TR	+
Kumm et al., 2021	3 sessions	N/A	3-week	SS	CO	+
Lastrapes et al., 2018	15-20-minute session, written instructions	10 lessons	2-month	SS	CO	+
Lee et al., 2017	N/A	10 lessons	N/A	PP	CO	+
Lin et al., 2022	Two days	6 weeks	N/A	RCT	PR	+
Lombas et al., 2019	16 hours	18 weeks	6-month	PP	TR	+
Lynne et al., 2017	15-minute session	6-7 days	Post-withdrawal	PP	CO	+
MacDonald et al., 2018	1 session	7-22 lessons	N/A	SS	CO	+
McHugh et al., 2016	1 session	N/A	N/A	PP	CO	+
Närhi et al., 2017	2 sessions	1 school year	1 year	PP	SR, TR	+
Naylor et al., 2018	Written instructions	3-4 days	N/A	SS	CO	+
O'Handley et al., 2020	N/A	2-3 weeks	N/A	PP	CO	+

Reinke et al., 2018	2 days	1 school year	Post-school year	RCT	SR, TR	+
Reinke et al., 2021	6 days	6 months	N/A	RCT	TR	+
Schulz et al., 2020	30 minutes	3-5 days	N/A	PP	CO	+
Schulz et al., 2022	30 minutes	N/A	N/A	SS	CO	+
Sheridan et al., 2017	1 session	12 weeks	12-week	PP	TR	+
Thomas et al., 2020	N/A	10 weeks	N/A	PP	SR, TR	+
Tolan et al., 2020	2 days	1 school year	N/A	RCT	CO, TR	+/-
Tur-Porcar et al., 2021	24 hours	N/A	N/A	RCT	TR	+
Van den berg et al., 2018	N/A	4 months	4-month	RCT	SR	+
Vargo et al., 2019	N/A	14 days	N/A	SS	CO, TR	+
Wills et al., 2021	50 minutes	10 weeks	N/A	RCT	CO	+
Wu et al., 2019	1 session	N/A	N/A	SS	CO	+

Note. Design: CS = case study, PP = pre-post, RCT = randomized controlled trial, SS = single-subject; Measures: CO = classroom observation, PR = peer reports, SR = student reports, TR = teacher reports.

3.1.3 Interventions

Brief descriptions of the interventions from the included studies can be found in Table 3. In total, there were 28 unique interventions. Given our inclusion criteria, all interventions were implemented by the classroom teacher who was teaching in an inclusive (not specialized) classroom. However, one intervention included students as implementers along with the classroom teacher who led the implementation. This intervention was "tootling" (Harry et al., 2022; McHugh et al., 2016), which required students to report on instances of positive behaviour for the intervention to be effective.

Most included studies reported some form of training for teachers to implement the intervention ($n = 40$). Most included studies reported the time devoted to implementing the study intervention ($n = 37$), with implementation durations ranging from six classroom lessons to two school years.

Table 3. Descriptions of Interventions Assessed in the Included Studies.

Intervention	Description	Studies
Behavior Bingo	A bingo-style game played while students are doing classwork. Only students who are showing on-task behaviour can participate. If prizes are won, they are granted to the entire class.	Collins et al., 2017
Behavior-Specific Praise	Praising students for positive or desirable behaviours when they occur.	Eaves et al., 2020; Eaves et al., 2021; Närhi et al., 2017; O'Handley et al., 2020
Brain Energizers	Brief classroom-based physical activities that involve movement to enhance learning.	Buchanan et al., 2021
Classroom Seating Arrangements	Students with disruptive behaviour are assigned seats adjacent to non-disruptive students and away from other students with disruptive behaviour.	Van den berg et al., 2018
Class-Wide Function-Related Intervention Teams (CW-FIT)	A multitiered program that uses Tier 1 (i.e., social skills instruction, group contingencies, and praise) and Tier 2 (i.e., self-management and help cards) strategies.	Caldarella et al., 2018; Naylor et al., 2018; Wills et al., 2021; Wu et al., 2019
Conjoint Behavioral Consultation	Parents and teachers mutually identify, define, analyze, and address student behaviour using strategies developed conjointly.	Sheridan et al., 2017

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Daily Report Card	Daily, teachers track a student's performance on 2-3 selected disruptive behaviours and provide feedback to the student. At the end of every school day, the progress is reviewed by teachers and parents to determine contingent privileges.	Canfield et al., 2021; Holdaway et al., 2020
Establish-Maintain-Restore	Teachers establish and maintain a positive relationship with the student. They also restore that relationship when necessary.	Duong et al., 2018
Good Behavior Game	Students are rewarded for displaying positive or desirable behaviours during class time. The class is typically divided into teams, with each team receiving points when a disruptive behaviour is displayed. The team with the fewest points is the winner and may receive a reward.	Bohan et al., 2021; Coombes et al., 2016; Ialongo et al., 2019; Lastrapes et al., 2018; Lynne et al., 2017; Tolan et al., 2020
Group Oriented Concurrent Chains (GOCC)	A form of group contingency program that incorporates the preferences of students in terms of the goals of the program.	Vargo & Becknell, 2019
Happy Classrooms Programme	A curriculum of mindfulness and character strengths activities for students.	Lombas et al., 2019
iClicker	An interactive classroom response system for multiple-choice or true-or-false questions.	Schulz et al., 2020; Schulz et al., 2022
Incredible Years	A classroom management program that uses social learning theory to train teachers to use classroom management strategies.	Reinke et al., 2018; Reinke et al., 2021
Kinder Training	A program that trains teachers in play-therapy strategies to enhance the student-teacher relationship.	Chen et al., 2018
Positive Interaction Ratio	Increasing the ratio of positive to negative interactions between the teacher and the students. The ideal ratio is 5:1.	Cook et al., 2017
Positive Plus Program	A group contingency program where the class earns points for positive or desirable behaviour on an individual, group, or class level.	Clair et al., 2017
Promoting Alternative Thinking Strategies (PATHS)	Teacher-provided explicit instruction in emotion regulation, self-control, social problem-solving, and conflict resolution.	Ialongo et al., 2019
Public Posting	Recording the name of students who have received praise on the classroom blackboard or whiteboard.	O'Handley et al., 2020
Response Cards	Cards/signs students hold up to show their response to a question in class.	Goodnight et al., 2021
Self and Match	A commercially available self-management system that involves conditioned reinforcement and goal setting.	Bulla et al., 2017
Social/emotional training	A curriculum teaching students social-emotional skills.	Hai et al., 2022; Lin et al., 2022; Tur-Porcar et al., 2021
Technology-Based Self-Management (i.e., SCORE IT)	A mobile application that students and teachers used to monitor up to three disruptive behaviours at 10-minute intervals during class time.	Kumm et al., 2021; Bruhn et al., 2017
Token Economy	A contingency management program that uses tokens as rewards for positive or desirable behaviours. Tokens	Lee et al., 2017

	may be exchanged for rewards and, in some implementations, be subtracted as a negative punishment.		
Tools for Getting Along	A 27-lesson curriculum designed to improve social problem-solving.	Daunic et al., 2019	
Tools of the Mind	A curriculum designed to improve social-emotional competence.	Blair et al., 2018	
Tootling	A peer reporting procedure where students report on the positive or desirable behaviours of other students, who then receive praise.	Harry et al., 2022; McHugh et al., 2016	
Visual Schedules	A visual representation of events or tasks that a student must engage in throughout the day.	MacDonald et al., 2018	
Yoga	Instructing students to engage in physical relaxation exercises that involve stretching and breathing.	Thomas et al., 2020	

3.1.4 Quality Ratings

The quality ratings for the studies included in the systematic review can be found in Table 4. The average rating for all studies was 17.46 (SD = 2.12; 65%) out of a possible 27. Ratings were typically lowered due to the lack of specific methods that were consistent across studies, including not reporting a distribution of principal confounders, not reporting actual probability values (i.e., reporting p < 0.05), not ensuring that samples were representative of their population, not blinding participants or researchers when randomization was used, making adjustments to analyses to account for potential confounding, and reporting an a priori power analysis to justify sample size.

Table 4. Quality Ratings of Included Studies

Reference	Overall	Reporting	External Validity	Internal Validity	Power
Blair et al., 2018	16	8	1	7	0
Bohan et al., 2021	16	8	1	7	0
Bruhn et al., 2017	18	7	3	8	0
Buchanan et al., 2021	13	5	1	7	0
Bulla et al., 2017	17	8	1	8	0
Caldarella et al., 2018	19	9	2	8	0
Canfield et al., 2021	17	9	1	7	0
Chen et al., 2018	17	8	1	8	0
Clair et al., 2017	17	7	2	8	0
Collins et al., 2017	17	6	3	8	0
Cook et al., 2017	19	8	1	9	1
Coombes et al., 2016	16	7	2	7	0
Daunic et al., 2019	15	6	2	6	1
Duong et al., 2018	20	8	2	9	1
Eaves et al., 2020	17	6	3	8	0
Eaves et al., 2021	16	8	1	7	0
Gettinger et al., 2021	20	10	1	9	0
Goodnight et al., 2021	18	9	1	8	0
Hai et al., 2021	19	9	1	9	0

Harry et al., 2022	17	9	1	7	0
Holdaway et al., 2020	17	9	1	7	0
Ialongo et al., 2019	21	9	3	8	1
Kumm et al., 2021	17	9	1	7	0
Lastrapes et al., 2018	15	6	1	8	0
Lee et al., 2017	15	7	0	8	0
Lin et al., 2022	21	10	1	10	0
Lombas et al., 2019	15	7	1	7	0
Lynne et al., 2017	17	7	2	8	0
MacDonald et al., 2018	18	9	1	8	0
McHugh et al., 2016	17	8	1	8	0
Närhi et al., 2017	19	9	2	8	0
Naylor et al., 2018	19	8	3	8	0
O'Handley et al., 2020	14	7	1	6	0
Reinke et al., 2018	18	7	2	9	0
Reinke et al., 2021	21	10	1	10	0
Schulz et al., 2020	18	9	1	8	0
Schulz et al., 2022	20	10	1	9	0
Sheridan et al., 2017	18	9	1	8	0
Thomas et al., 2020	16	7	1	8	0
Tolan et al., 2020	13	7	1	6	0
Tur-Porcar et al., 2022	20	10	1	9	0
Van den berg et al., 2018	20	7	2	11	0
Vargo et al., 2019	13	5	1	7	0
Wills et al., 2021	21	10	1	10	0
Wu et al., 2019	19	8	3	8	0

3.2 Meta-Analysis

Of the 35 included studies, 27 reported effect sizes or data from which an effect size could be calculated. Following the recommendations outlined by Field and Gillett (2010), all effect sizes were converted to Pearson's r. For studies that reported multiple effect sizes ($n = 10$), only the effect sizes that were directly relevant to DCB (e.g., measures of aggression, measures of off-task behaviour) were included in the analysis (excluded measures: e.g., teacher-parent relationship quality, academic achievement).

A total of 67 effect sizes were included. Table 5 contains the converted effect sizes and sample sizes. Sample sizes ranged from 4 to 5611 participants and effect sizes ranged from $r = 0.00$ to 0.99, 37 were large (i.e., $r > 0.5$), five were moderate ($0.3 < r < 0.5$), and 25 wwere small (i.e., $r < 0.3$). Based on the results of a Hedges-Vevea random-effects model (Hedges & Vevea, 1998), the mean Pearson's r of teacher-implemented in-class interventions for disruptive behaviour was 0.766 (95% CI [0.654, 0.846]), suggesting a positive and large effect overall. See Figure 2 for a forest plot comparing the effect sizes of all studies included in the meta-analysis and the combined effect size.

Table 5. Sample Sizes and Converted Effect Sizes from Studies Included in the Meta-analysis

Reference	*n*	*r*
Blair et al., 2018	715	0.12
Bohan et al., 2021	21	0.93
Bohan et al., 2021	21	0.92
Bohan et al., 2021	21	0.94
Bohan et al., 2021	21	0.86
Bohan et al., 2021	21	0.93
Bohan et al., 2021	21	0.90
Caldarella et al., 2018	350	0.05
Caldarella et al., 2018	350	0.00
Cook et al., 2017	159	0.43
Coombes et al., 2016	222	0.16
Daunic et al., 2019	2079	0.10
Duong et al., 2019	190	0.48
Gettinger et al., 2021	6	0.97
Harry et al., 2022	16	0.99
Harry et al., 2022	16	0.88
Harry et al., 2022	18	0.99
Harry et al., 2022	18	0.85
Harry et al., 2022	17	0.59
Harry et al., 2022	17	0.98
Harry et al., 2022	20	0.95
Harry et al., 2022	20	0.75
Holdaway et al., 2020	37	0.55
Ialongo et al., 2019	5611	0.04
Lee et al., 2017	24	0.99
Lee et al., 2017	24	0.99
Lee et al., 2017	29	0.94
Lee et al., 2017	29	0.99
Lin et al., 2022	250	0.76
Lin et al., 2022	250	0.56
Lin et al., 2022	250	0.20
Lin et al., 2022	250	0.54
Lin et al., 2022	250	0.09
Lin et al., 2022	250	0.63
Lombas et al., 2019	524	0.13
Lombas et al., 2019	524	0.09
Lynne et al., 2017	27	0.94
Lynne et al., 2017	19	0.96
Lynne et al., 2017	19	0.94
McHugh et al., 2016	20	0.93

McHugh et al., 2016	21	0.96
McHugh et al., 2016	23	0.96
Närhi et al., 2017	50	0.01
O'Handley et al., 2020	23	0.99
O'Handley et al. (2020)	18	0.99
O'Handley et al. (2020)	18	0.43
O'Handley et al. (2020)	25	0.99
O'Handley et al. (2020)	25	0.2
Reinke et al. (2018)	1817	0.07
Reinke et al. (2021)	1817	0.05
Schulz et al. (2020)	4	0.94
Schulz et al. (2020)	4	0.97
Sheridan et al. (2017)	267	0.08
Sheridan et al. (2017)	267	0.08
Sheridan et al. (2017)	267	0.09
Sheridan et al. (2017)	267	0.07
Thomas et al. (2020)	40	0.11
Thomas et al. (2020)	40	0.2
Tolan et al. (2020)	188	0.33
Tolan et al. (2020)	188	0.26
Tolan et al. (2020)	188	0.23
Tur-Porcar (2021)	555	0.11
Van den berg et al. (2018)	1535	0.17
Wills et al. (2021)	70	0.42

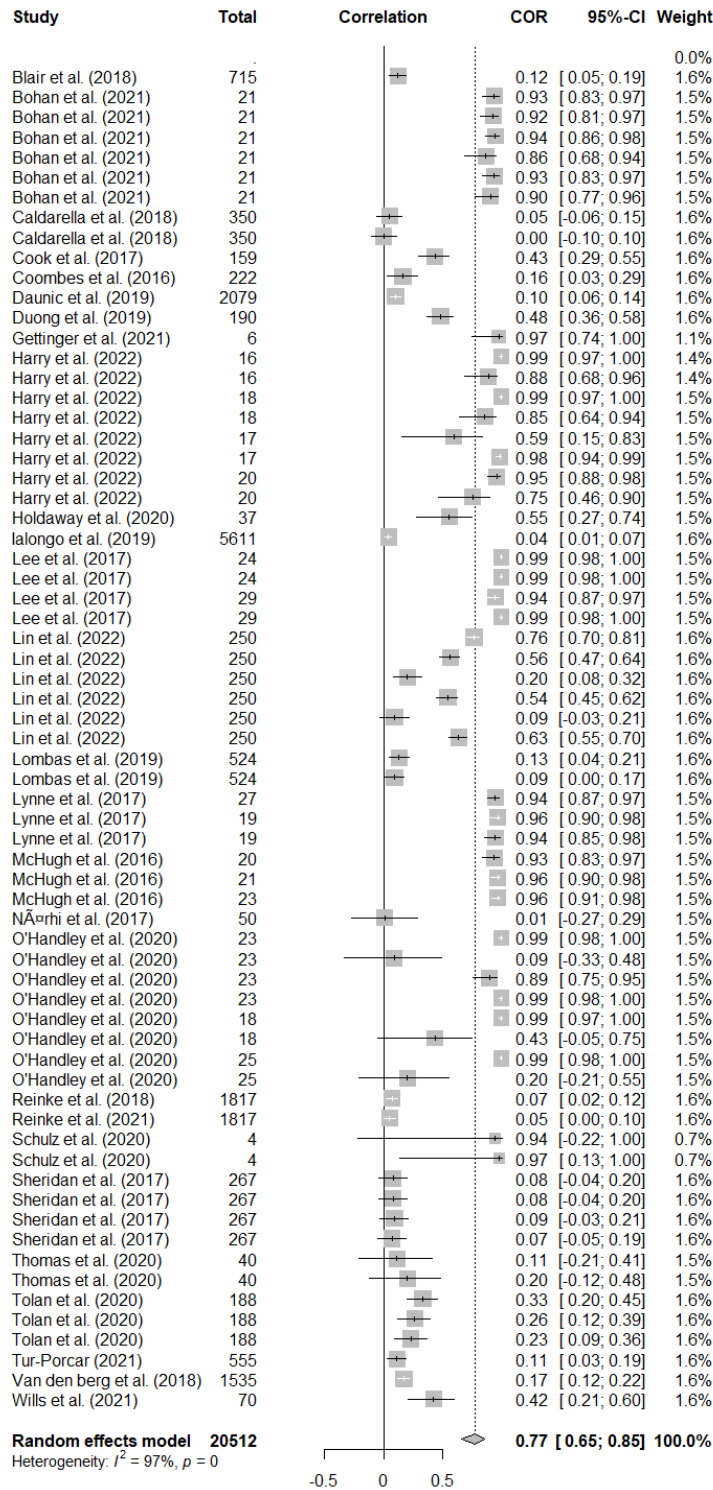| Study	Total	Correlation	COR	95%-CI	Weight
					0.0%
Blair et al. (2018)	715		0.12	[0.05; 0.19]	1.6%
Bohan et al. (2021)	21		0.93	[0.83; 0.97]	1.5%
Bohan et al. (2021)	21		0.92	[0.81; 0.97]	1.5%
Bohan et al. (2021)	21		0.94	[0.86; 0.98]	1.5%
Bohan et al. (2021)	21		0.86	[0.68; 0.94]	1.5%
Bohan et al. (2021)	21		0.93	[0.83; 0.97]	1.5%
Bohan et al. (2021)	21		0.90	[0.77; 0.96]	1.5%
Caldarella et al. (2018)	350		0.05	[-0.06; 0.15]	1.6%
Caldarella et al. (2018)	350		0.00	[-0.10; 0.10]	1.6%
Cook et al. (2017)	159		0.43	[0.29; 0.55]	1.6%
Coombes et al. (2016)	222		0.16	[0.03; 0.29]	1.6%
Daunic et al. (2019)	2079		0.10	[0.06; 0.14]	1.6%
Duong et al. (2019)	190		0.48	[0.36; 0.58]	1.6%
Gettinger et al. (2021)	6		0.97	[0.74; 1.00]	1.1%
Harry et al. (2022)	16		0.99	[0.97; 1.00]	1.4%
Harry et al. (2022)	16		0.88	[0.68; 0.96]	1.4%
Harry et al. (2022)	18		0.99	[0.97; 1.00]	1.5%
Harry et al. (2022)	18		0.85	[0.64; 0.94]	1.5%
Harry et al. (2022)	17		0.59	[0.15; 0.83]	1.5%
Harry et al. (2022)	17		0.98	[0.94; 0.99]	1.5%
Harry et al. (2022)	20		0.95	[0.88; 0.98]	1.5%
Harry et al. (2022)	20		0.75	[0.46; 0.90]	1.5%
Holdaway et al. (2020)	37		0.55	[0.27; 0.74]	1.5%
Ialongo et al. (2019)	5611		0.04	[0.01; 0.07]	1.6%
Lee et al. (2017)	24		0.99	[0.98; 1.00]	1.5%
Lee et al. (2017)	24		0.99	[0.98; 1.00]	1.5%
Lee et al. (2017)	29		0.94	[0.87; 0.97]	1.5%
Lee et al. (2017)	29		0.99	[0.98; 1.00]	1.5%
Lin et al. (2022)	250		0.76	[0.70; 0.81]	1.6%
Lin et al. (2022)	250		0.56	[0.47; 0.64]	1.6%
Lin et al. (2022)	250		0.20	[0.08; 0.32]	1.6%
Lin et al. (2022)	250		0.54	[0.45; 0.62]	1.6%
Lin et al. (2022)	250		0.09	[-0.03; 0.21]	1.6%
Lin et al. (2022)	250		0.63	[0.55; 0.70]	1.6%
Lombas et al. (2019)	524		0.13	[0.04; 0.21]	1.6%
Lombas et al. (2019)	524		0.09	[0.00; 0.17]	1.6%
Lynne et al. (2017)	27		0.94	[0.87; 0.97]	1.5%
Lynne et al. (2017)	19		0.96	[0.90; 0.98]	1.5%
Lynne et al. (2017)	19		0.94	[0.85; 0.98]	1.5%
McHugh et al. (2016)	20		0.93	[0.83; 0.97]	1.5%
McHugh et al. (2016)	21		0.96	[0.90; 0.98]	1.5%
McHugh et al. (2016)	23		0.96	[0.91; 0.98]	1.5%
Nährhi et al. (2017)	50		0.01	[-0.27; 0.29]	1.5%
O'Handley et al. (2020)	23		0.99	[0.98; 1.00]	1.5%
O'Handley et al. (2020)	23		0.09	[-0.33; 0.48]	1.5%
O'Handley et al. (2020)	23		0.89	[0.75; 0.95]	1.5%
O'Handley et al. (2020)	23		0.99	[0.98; 1.00]	1.5%
O'Handley et al. (2020)	18		0.99	[0.97; 1.00]	1.5%
O'Handley et al. (2020)	18		0.43	[-0.05; 0.75]	1.5%
O'Handley et al. (2020)	25		0.99	[0.98; 1.00]	1.5%
O'Handley et al. (2020)	25		0.20	[-0.21; 0.55]	1.5%
Reinke et al. (2018)	1817		0.07	[0.02; 0.12]	1.6%
Reinke et al. (2021)	1817		0.05	[0.00; 0.10]	1.6%
Schulz et al. (2020)	4		0.94	[-0.22; 1.00]	0.7%
Schulz et al. (2020)	4		0.97	[0.13; 1.00]	0.7%
Sheridan et al. (2017)	267		0.08	[-0.04; 0.20]	1.6%
Sheridan et al. (2017)	267		0.08	[-0.04; 0.20]	1.6%
Sheridan et al. (2017)	267		0.09	[-0.03; 0.21]	1.6%
Sheridan et al. (2017)	267		0.07	[-0.05; 0.19]	1.6%
Thomas et al. (2020)	40		0.11	[-0.21; 0.41]	1.5%
Thomas et al. (2020)	40		0.20	[-0.12; 0.48]	1.5%
Tolan et al. (2020)	188		0.33	[0.20; 0.45]	1.6%
Tolan et al. (2020)	188		0.26	[0.12; 0.39]	1.6%
Tolan et al. (2020)	188		0.23	[0.09; 0.36]	1.6%
Tur-Porcar (2021)	555		0.11	[0.03; 0.19]	1.6%
Van den berg et al. (2018)	1535		0.17	[0.12; 0.22]	1.6%
Wills et al. (2021)	70		0.42	[0.21; 0.60]	1.6%
Random effects model	**20512**		**0.77**	**[0.65; 0.85]**	**100.0%**

Heterogeneity: $I^2 = 97\%$, $p = 0$

-0.5   0   0.5

Figure 2. A Forest Plot of the Reported Effect Sizes (Converted to Pearson's R) of the Reviewed Studies

4. Discussion

Disruptive classroom behaviour (i.e., off-task behaviour, non-compliance, and aggression; Schaeffer et al., 2006; Yoder & Williford, 2019) is highly prevalent and can have negative effects on the student themselves, their classmates, and teachers (Kaufman et al., 2010; Klassen & Chiu, 2010; McDaniel et al., 2017; Skiba et al., 1997;

Wright & Dusek, 1998; Yoder & Williford, 2019). As indicated by previous studies (Chaffee et al., 2017; Dart et al., 2014; Klingbeil et al., 2017; Rollo et al., 2018; Warmbold-Brann et al., 2017; Wilson and Lipsey, 2007), evidence-based interventions exist for DCB, but it is unknown how many are teacher-implemented within the inclusive classroom, and the effectiveness of these interventions. Therefore, the current systematic review and meta-analysis took a unique approach to summarize the literature by focusing on teacher-implemented in-class interventions for DCB.

Based on the current systematic review results, previous studies have explored a wide variety of teacher-implemented in-class interventions with highly variable implementation approaches (e.g., length of implementation, training). Although the number of studies included in the systematic review was relatively small ($n = 45$) when compared to the samples of previous reviews (e.g., $n = 249$), the unique approach of the systematic review allows for the examination of a specific subset of interventions: teacher-implemented in-class interventions. The results of the included studies overwhelmingly suggest that these interventions effectively reduce DCB, speaking to the feasibility of teacher-implemented in-class interventions.

For the meta-analysis, it was expected that teacher-implemented in-class interventions would reduce disruptive behaviour, demonstrated through an overall positive effect. The results of the current meta-analysis found that there is a large positive effect of teacher-implemented in-class interventions for disruptive behaviour, which is in line with previous research focused on school-based interventions for disruptive behaviour (Chaffee et al., 2017; Wilson & Lipsey, 2007). However, it is important to note that the overall methodological quality of the included studies was weak, suggesting that bias due to methodological constraints is a distinct possibility. These results also highlight that this research body still requires more methodological rigour despite the number of previous studies included in the current study.

It is also important to note the influence of sample size on the effects of the included studies and the overall effect calculated in the meta-analysis. Although there were some moderate effect sizes, most of the effect sizes included in the meta-analysis were either small ($r < 0.3$) or large ($r > 0.5$). All the studies with large effect sizes had fewer than 40 participants, and most ($n = 19$) of the studies with small effect sizes had more than 100 participants. The effect sizes from studies with smaller sample sizes may be inflated and, in turn, may have inflated the overall effect seen in the current study. As such, it may be the case that the small effect sizes seen in studies with larger samples may be more reflective of the true effect of teacher-implemented in-class interventions for DCB. However, small effect sizes can also indicate lower statistical power, another source of potential bias.

4.1 Strengths and Limitations

The primary strength of the current study is its approach to summarizing the literature. Previous studies have taken a broadly inclusive approach, focusing on interventions implemented in the classroom or elsewhere within the school (e.g., resource centre, playground, library) and by any school personnel, researchers, or other non-school staff (Chaffee et al., 2017; Dart et al., 2014; Klingbeil et al., 2017; Rollo et al., 2018; Warmbold-Brann et al., 2017; Wilson & Lipsey, 2007). However, since the current study focused solely on teacher-implemented in-class interventions for DCB, it demonstrates the potential for teachers to implement these interventions.

The current study's limitations are related to the studies included in the systematic review and meta-analysis. Firstly, none of the studies identified through the systematic review were conducted in Canada, making their results limited in generalizability to Canadian classroom teachers. Secondly, the estimated combined effect size calculated for the current meta-analysis is based on several interventions. Although the included interventions are broadly similar in reducing or modifying DCBs, each intervention approach included unique strategies to reach this goal. As such, the impact of individual interventions on individual outcomes needs to be further evaluated (see Table 3). The combined effect size presented in the current meta-analysis is also not definitive. Some studies included in the systematic review were not included in the meta-analysis due to their sample size or methodology. Since these studies were not included in the meta-analysis, the overall estimated effect size may not entirely represent the interventions presented in these studies. Thirdly, the extent to which medication may have impacted the results of the included studies is unclear as only one of the included studies reported on the number of participants who were medicated but did not report on details of those medications (e.g., dose, medication type, purpose; Holdaway et al., 2020). Finally, the effect size calculation used in the current study is likely biased by the sample sizes and low-quality methodologies in the included studies. Additionally, due to the known publication bias in psychological research, it is likely that the sample of studies included in the current meta-analysis are not representative of all studies examining teacher-implemented in-class interventions and are biased towards those studies that supported the interventions under evaluation (Kühberger et al., 2014).

4.2 Future Directions

The current study results provide a foundation for future research into teacher-implemented in-class interventions for disruptive behaviour. However, these studies' overall low methodological quality is of particular concern. Methodological quality can be improved by conducting more randomized controlled trials to determine the effectiveness of interventions. Additionally, future studies should seek to conduct moderation or mediation analyses to determine whether any contextual variables (e.g., grade level, location) notably contribute to the link between disruptive behaviour and teacher-implemented in-class interventions. Finally, future studies should also increase the sample sizes used to test interventions, which would be necessary to conduct randomized controlled trials.

5. Conclusion

Based on the systematic review results, teacher-implemented in-class interventions for DCB are heterogeneous but have consistent evidence for effectiveness. Furthermore, based on the meta-analysis results, these interventions also seem to have an overall positive impact on DCB. Still, the magnitude of that impact is unclear due to the overall low methodological quality of the included studies. While further research is required, the results of this study support the use of EBIs for DCB by classroom teachers and provide a foundation on which future studies can explore the nuances of teacher-implemented in-class interventions. The results of the current study also clearly indicate the dire need for more research on these types of interventions, especially considering how common DCB is.

Author Contributions

Conceptualization: M.O., C.C., I.S., & P.C.

Data curation: M.O. & P.C.

Formal analysis: M.O., J.I., A.I., & P.C.

Investigation: M.O., J.I., & A.I.

Methodology: M.O., C.C., I.S., & P.C.

Project administration: M.O. & P.C.

Resources: P.C.

Software: P.C.

Supervision: C.C., I.S., & P.C.

Validation: M.O., J.I., A.I., & P.C.

Visualization: M.O.

Writing – original draft: M.O.

Writing – review and editing: M.O., J.I., A.I., C.C., I.S., & P.C.

Data Availability

No new data were created or analyzed in this study. Data sharing is not applicable to this article.

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Conflicts of Interest

The authors declare no conflict of interest.

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