Fifty years of preventing and treating childhood behaviour disorders: a systematic review to inform policy and practice

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ABSTRACT

Question Oppositional defiant and conduct disorders (ODD and CD) start early and persist, incurring high individual and collective costs. To inform policy and practice, we therefore asked: What is the best available research evidence on preventing and treating these disorders?

Study selection and analysis We sought randomised controlled trials (RCTs) evaluating interventions addressing the prevention or treatment of behaviour problems in individuals aged 18 years or younger. Our criteria were tailored to identify higher-quality RCTs that were also relevant to policy and practice. We searched the CINAHL, ERIC, MEDLINE, PsycINFO and Web of Science databases, updating our initial searches in May 2017. Thirty-seven RCTs met inclusion criteria—evaluating 15 prevention programmes, 8 psychosocial treatments and 5 medications. We then conducted narrative synthesis.

Findings For prevention, 3 notable programmes reduced behavioural diagnoses: Classroom-Centered Intervention; Good Behavior Game; and Fast Track. Five other programmes reduced serious behaviour symptoms such as criminal activity. Prevention benefits were long term, up to 35 years. For psychosocial treatment, Incredible Years reduced behavioural diagnoses. Three other interventions reduced criminal activity. Psychosocial treatment benefits lasted from 1 to 8 years. While 4 medications reduced post-test symptoms, all caused important adverse events.

Conclusions Considerable RCT evidence favours prevention.

Clinical implications Effective prevention programmes should therefore be made widely available. Effective psychosocial treatments should also be provided for all children with ODD/CD. But medications should be a last resort given associated adverse events and given only short-term evidence of benefits. Policymakers and practitioners can help children and populations by acting on these findings.

BACKGROUND

Oppositional defiant and conduct disorders (ODD and CD) are important public health and children's mental health problems. They involve severe and persistent patterns of disruptive behaviour that fall well outside expected norms and that interfere with healthy development, with CD being the more serious condition.[1 2] These 2 mental disorders are important, in part, because of their high prevalence. Globally, recent estimates suggest rates of 3.6% for ODD and 2.1% for CD.[3] Disruptive behaviours have also long been a leading reason for referrals to children's mental health services.[4] As well, because these disorders typically start in childhood then persist into adulthood, they cause inordinate burdens.[5] The children experience significant social and emotional impairments, with concomitant distress and lost human potential.[6] Society also incurs substantial healthcare, justice, child welfare and education costs—such that preventing just 1 case of CD at birth may yield lifetime savings of as much as $3.0–5.1M, based on cost analyses across multiple sectors in the USA (USD, 2017 equivalency).[7]

From a children's rights perspective, prevention should be the highest priority given that behaviour disorders have been causally associated with serious but avoidable adversities such as family socioeconomic disadvantage and child maltreatment.[6 8–10] In effect, when avoidable cases are allowed to develop, children are doubly disadvantaged, experiencing both the causes and consequences of behaviour disorders.[11] Many prevention programmes for ODD/CD have also been shown to be cost-effective.[12] Yet programmes for the prevention of these disorders—or of their underlying causal conditions such as child maltreatment—have yet to become widespread.[13–15]

Exacerbating the burdens, there are also acute shortages of children's mental health treatment services. Even in high-income countries such as the UK, USA and Canada, as many as 70% of young people with mental disorders do not receive needed specialised treatment services.[16] This is despite substantial (and growing) annual health expenditures in these jurisdictions.[17–19] Globally, the situation is much worse. Many low-income countries have yet to place children's mental health on the public policy agenda, and mental health service shortfalls in these countries reach or exceed 90%.[20–22] Amid these shortfalls, one approach nevertheless appears to be thriving, at least in high-income countries—the use of pharmacological treatments. For example, psychotropic prescriptions for children have increased approximately twofold in the UK and three-to-fourfold in Canada in recent decades, particularly for antipsychotics which are increasingly being used to treat behaviour disorders.[23–26]

To begin to address the shortfalls and imbalances, policymakers need robust research evidence to guide public spending priorities. In parallel, practitioners need robust research evidence to inform the implementation of more effective programmes and services for children.

OBJECTIVE

To inform policy and practice, we therefore asked: what is the best available research evidence on preventing and treating ODD and CD? To provide comprehensive information, we included the full intervention continuum: prevention programmes, psychosocial treatments and pharmacological treatments. We were aware of only 1 such previous comprehensive review of ODD/CD interventions, Connor *et al* (2006),[27] which covered studies published from 1980 to 2005. We specifically built on this review, covering older studies (published from 1965 onwards) as well as newer studies (published from 2005 through 2017). We also expanded on previous reviews that examined only prevention (eg, Waddell *et al*, 2007),[28] only treatment (eg, National Collaborating Centre for Mental Health, 2013)[29] or only specific types of interventions (eg, Woolfenden *et al*, 2002; Barlow *et al*, 2011; Sanders *et al*, 2014; Bakker *et al*, 2017).[30–33] To our knowledge, no recent systematic review has covered this comprehensive range of ODD/CD interventions.

STUDY SELECTION AND ANALYSIS

We first searched the CINAHL, ERIC, MEDLINE and PsycINFO databases using the terms: *conduct disorder*, *oppositional defiant disorder*, *child behaviour disorder*, *aggressive behaviour* OR *juvenile delinquency* AND *prevention*, *intervention* OR *treatment*. To identify additional studies, we searched the journal, *Evidence-Based Mental Health,* and searched the Cochrane and Campbell Collaboration databases, identifying relevant

Table 1	Randomised controlled trial inclusion criteria*
1	Children ≤18 years of age were the main focus or were clearly reported on separately if part of an adult study.
2	Interventions addressed childhood behaviour problems, including ODD and/or CD.
	a. For prevention, at enrolment/pretest, <50% had a *primary* ODD/CD diagnosis or had been referred for treatment for behaviour problems or had been arrested.
	b. For treatment, at enrolment/pretest, ≥50% had a *primary* ODD/CD diagnosis or had been referred for treatment for behaviour problems or had been arrested.
3	Clear descriptions were provided of participant characteristics, study settings and interventions.
4	Participants (or clusters) were randomly assigned to intervention and either control (no-intervention) or comparison (treatment-as-usual) groups at study outset.
5	Behaviour indicators included either one diagnostic measure where the diagnostician was blinded, or two symptom measures evaluated by two or more informant sources, eg, child, parent or teacher, at least one of whom was blinded.
6	Outcome measures pertained to ODD/CD, eg, scales had established reliability and validity or ≥50% of items addressed ODD/CD symptoms.
7	Maximum attrition was 20% at post-test (medication studies) or at follow-up (prevention or psychosocial treatment studies) or authors used intention-to-treat analyses.
8	For prevention and psychosocial treatment studies, postintervention follow-up was 3 months or more.
9	For medication studies, double-blinding and placebo controls were used, and side effects were comprehensively assessed.
10	Statistical significance (using $p<0.05$) was reported for relevant outcome measures at post-test (medication studies) or at follow-up (prevention and psychosocial treatment studies).
11	Interventions were evaluated in high-income countries (by World Bank standards).
12	Studies were not limited to specialised populations, such as children residing in abused women's shelters, to retain broad applicability to children at risk of or who have ODD/CD.

*For inclusion, all criteria had to be met.

CD, conduct disorder; ODD, oppositional defiant disorder.

Figure 1 Search process adapted from CONSORT flow diagram.[47]

systematic reviews that we then hand-searched. We applied limiters, seeking only randomised controlled trials (RCTs) evaluating interventions addressing the prevention or treatment of behaviour problems in individuals aged 18 years or younger. We limited our searches to English-language articles due to most research being published in this language and due to translation capacity not being available within the team. We also chose to seek articles published over the past 50 years (January 1965 through May 2017, which was the time of the last search update) to ensure comprehensiveness while also ensuring complete coverage of important databases such as MEDLINE and ERIC, which began in 1966. Following these searches, after screening the titles, 2 authors independently assessed all relevant abstracts to identify eligible RCTs. Subsequently, 2 authors independently assessed all retrieved articles, identifying RCTs that met all the inclusion criteria. We then identified supplemental publications on these RCTs by searching the Web of Science database using intervention names, author names and article titles. This added search yielded new follow-up data from the previously identified RCTs as well as new RCTs that were assessed using the procedures noted above. Table 1 shows the inclusion criteria. Figure 1 shows the search process.

We took several steps to maximise quality and minimise risk of bias. To ensure high-quality evaluations, only RCTs were included. Our inclusion criteria also specified additional quality indicators, namely blinding of at least 1 informant source for psychosocial studies and
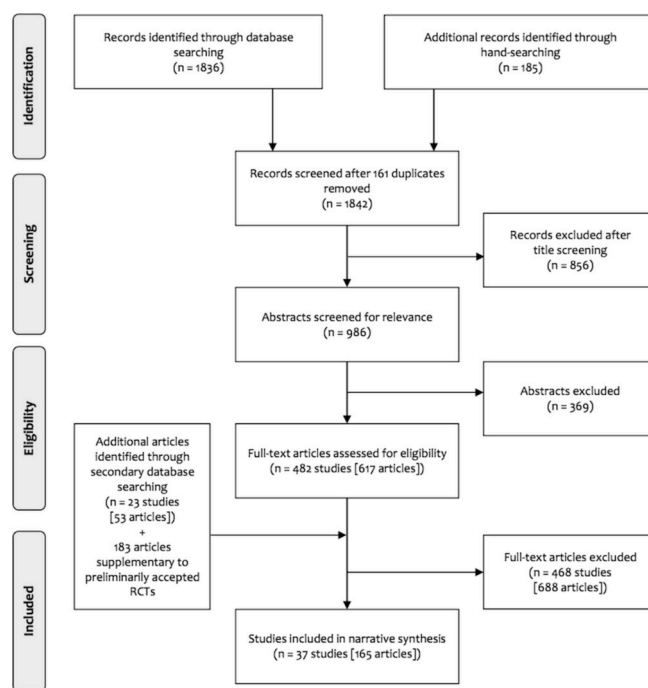
double-blinding for medication studies. To minimise risk of bias, 2 or more authors independently verified search results, screened abstracts and assessed retrieved articles. At each step, disagreements were resolved by consensus. Data extraction, verification, analysis and interpretations were also performed using consensus. To maximise policy and practice applicability, we focused on studies conducted in high-income countries, given that low-income countries have yet to be able to mobilise children's mental health services on any large scale.[20–22] This approach yielded 37 RCTs (described in 165 articles) that met inclusion criteria—reporting on 15 prevention programmes, 8 psychosocial treatments and 5 pharmacological treatments. We then assessed the risk of bias for each of these 37 RCTs using the Cochrane risk-of-bias tool.[34]

Due to heterogeneity in both participants and interventions in the included studies, a meta-analysis was not conducted. Rather, we structured a narrative synthesis according to intervention types and outcomes. Interventions were first categorised as prevention programmes, psychosocial treatments or pharmacological treatments. Behaviour findings pertaining to ODD/CD were then extracted, including long-term outcomes for related adult conditions such as antisocial personality disorder (ASPD). Diagnostic findings were extracted for all follow-up periods. Symptom findings were extracted for the longest available follow-up period or for 2 follow-up periods when needed to meet the criterion of reporting on 2 or more behaviour symptoms (including 1 that was blinded). (This latter step allowed us to include a broader range of interventions of relevance to policy and practice, while still ensuring rigour.)

Next, we evaluated the overall quality of the findings. We deemed interventions 'notable' if RCTs showed significant reductions in rates of childhood ODD/CD and/or adult ASPD diagnoses, given that diagnostic outcomes are a particularly robust indicator of effectiveness. We also noted effect sizes, where available, for both diagnostic and behaviour symptom outcomes. Meanwhile, we deemed adverse events associated with medications to be 'important' if they included any of the following symptoms: neurological (dizziness, nausea, vomiting, dystonia, drooling, tremor, headache or diplopia); gastrointestinal (abdominal pain); cardiovascular (tachycardia); endocrine (increased prolactin levels); genitourinary (excessive thirst or excessive urination) and psychiatric (sedation, fatigue, irritability, restlessness or anxiety). This review was registered

with PROSPERO (registration number CRD42016052643; see www.crd.york.ac.uk/PROSPERO/).

FINDINGS

Prevention programmes

Sixteen RCTs met inclusion criteria, evaluating 15 different prevention programmes.[w48-w75] *Incredible Years* was evaluated in 3 RCTs, while the *Positive Parenting Program* (*Triple P*) was evaluated in 2 RCTs. As well, 2 RCTs evaluated 2 different programmes: *Classroom-Centered Intervention* and *Family School Partnership*, each assessed independently; and *Triple P* and *Promoting Alternative Thinking Strategies* (*PATHS*), each assessed both independently and in combination. Most programmes included parent training. Many also focused on developing children's social skills and/or their academic skills. All programmes were delivered in community settings such as homes, preschools and schools. Three interventions were delivered universally, while 12 were delivered to children at risk or their parents. Intervention duration ranged widely—from 1 month to 10 years.

Thirteen of 15 prevention programmes succeeded in significantly reducing diagnoses or symptoms or both. Three programmes were notable for significantly reducing childhood CD or adult ASPD diagnoses: *Good Behavior Game* (ASPD diagnoses);[w48] *Classroom-Centered Intervention* (which included *Good Behavior Game;* CD diagnoses, OR=0.42);[w54] and *Fast Track* (ASPD diagnoses, OR=0.60).[w63]

As well, 5 programmes significantly reduced particularly serious behaviour symptoms, namely engagement in criminal activities, arrests or days incarcerated. These programmes included: *Coping Power* (criminal activities, Cohen's *d* [*d*]=0.27);[w57] *Fast Track* (convictions/diversions for violent and substance-related crimes);[w63] *Nurse-Family Partnership* (arrests, convictions and probation violations and adjudications as a being in need of supervision);[w70] *Parent Management Training–Oregon* (arrests, *d*=0.28 and younger age at first arrest);[w71] and *Perry Preschool* (arrests, OR=0.54 and months sentenced to prison, OR=0.48).[w72]

Six additional programmes significantly reduced at least 1 behaviour symptom. These included: *Chicago Parent Program* (behaviour problems);[w55] *Family Check-Up* (behaviour problems);[w60] *Family School Partnership* (behaviour problems, *d*=0.29 and school suspensions, OR=0.59);[w53–w54] *Incredible Years Basic* (behaviour problems, *d*=0.63 and 0.89)[w65] and coupled with *Incredible Years Enhanced* (aggression);[w67] *Research-Based Developmentally Informed* (*REDI*) program (behaviour problems, *d*=0.25);[w74] and *Triple P I* (behaviour problems)[w49] and *II* (behaviour problems and aggression, *d*=0.11 and 0.15, respectively).[w51] Only 2 interventions failed to show any behaviour benefits at relevant follow-up: *Montreal Prevention Program*[w68-w69] and *PATHS*.[w51] Table 2 summarises the 15 programmes and their evaluations.

Reported effect sizes varied, as noted above. For reductions in diagnoses, these ranged from OR=0.42 (for *Classroom-Centered Intervention)* to OR=0.60 (for *Fast Track*). For reductions in criminal behaviours, these ranged from *d*=0.27 (for *Coping Power*) to OR=0.48 (for *Perry Preschool*). Effect sizes for reductions in general behaviour symptoms, meanwhile, ranged from *d*=0.11 (for *Triple P II*) to *d*=0.89 (for *Incredible Years Basic)*. These numbers suggest modest-to-moderately robust effects overall. Adverse events were not reported for any of the included prevention programmes.

Psychosocial treatments

Thirteen RCTs met inclusion criteria, evaluating 8 different psychosocial treatments.[w76–w93] All included parents in at least 1 version of the intervention. Five also intervened directly with children, eg, providing cognitive-behavioural therapy or social skills training. Some also provided family therapy. Treatments were delivered in clinics as well as homes, schools and other community settings. One intervention involved placing youth in specialised foster homes. Interventions were relatively short—ranging from 2 weeks to 7 months.

Five of 8 psychosocial treatments significantly reduced diagnoses or symptoms or both. One treatment—*Incredible Years*—was notable for significantly reducing ODD diagnoses. *Incredible Years Basic* reduced ODD diagnoses at 7.8 year (final) follow-up (OR=0.20).[w77] *Incredible Years Basic Plus Literacy* also reduced ODD diagnoses at 4-month follow-up (OR=0.30);[w79] however, by 5.8-year (final) follow-up, this outcome was no longer statistically significant.[w77] Three programmes stood out for significantly reducing particularly serious behaviour symptoms, namely engagement in criminal activities or days incarcerated. These treatments included: *Brief Intervention–Youth Only* (arrests);[w76] *Multidimensional Treatment Foster Care I* (violent offences)[w80] and *II* (days incarcerated);[w82] and *Multisystemic Therapy II* (criminal activities, OR=0.41)[w84] and *IV* (property offences, *d*=0.37).[w87] One other programme, *Parent-Child Interaction Therapy*, reduced 1 (non-criminal) symptom (behaviour problems, *d*=0.61–0.64).[w90] The remaining 3 programmes—*Parent Management Training–Oregon, Protocol for Onsite Nurse-Administered Intervention* and *Strongest Families*—failed to produce positive behaviour outcomes at relevant follow-up.[w91–w93] Table 3 summarises the 8 psychosocial treatments and their evaluations.

Reported effect sizes varied, as noted above. For reductions in diagnoses, effect size was OR=0.20 (for *Incredible Years Basic*). For reductions in criminal behaviour, effect sizes ranged from *d*=0.37 (for *Multisystemic Therapy IV*) to OR=0.41 (for *Multisystemic Therapy II).* The one programme that reduced general behaviour symptoms had effect sizes of *d*=0.61–0.64 (for *Parent-Child Interaction Therapy).* These numbers suggest modest-to-moderately robust effects overall. Adverse events were not reported for any of the included psychosocial treatments.

Pharmacological treatments

Eight RCTs met inclusion criteria, evaluating 5 different medications: 3 antipsychotics (haloperidol, quetiapine and risperidone), 1 antiepileptic (carbamazepine) and 1 mood stabiliser (lithium).[w94–w101] RCTs were conducted in inpatient and outpatient settings. All RCTs assessed outcomes at post-test but not beyond, and assessed symptoms but not diagnoses.

All pharmacological treatments succeeded in reducing child behaviour symptoms with the exception of carbamazepine. Two RCTs also provided data on effect sizes, showing large benefits. Specifically, lithium significantly reduced the odds of children experiencing behaviour symptoms (OR=9.3)[w97] while quetiapine significantly reduced symptom severity (*d*=1.6).[w98] However, adverse events were reported for most children across all the RCTs—100% of children in some cases. As well, important adverse events were noted for at least 50% of intervention children in at least 1 RCT for all medications. These problems included: dizziness (carbamazepine);[w94] sedation and dystonia (haloperidol);[w95] nausea, vomiting, excessive thirst and excessive urination (lithium);[w97] irritability, restlessness, agitation, anxiety and sedation (quetiapine);[w98] and fatigue and sedation (risperidone).[w99 w101] Table 4 summarises the 5 pharmacological treatments and their evaluations.

Risk of bias in included studies

Applying the Cochrane risk-of-bias assessment tool,[34] we identified the following indicators of risk for our included RCTs. For prevention studies, selection bias was unclear for most; performance bias was high for all; detection bias was low for most; and attrition and reporting biases were low for all. For psychosocial treatment studies, selection bias was unclear for most; performance bias was high for all; detection bias was high for most and attrition and reporting biases were low for all. For medication studies, meanwhile, selection bias was unclear for most, while performance, detection, attrition and reporting biases were low for all. The overall risk-of-bias profile was therefore more favourable for medication

Table 2 Prevention programme descriptions and evaluation findings

Programme	Sample size (country)	Ages/Grades at programme start (risk factors)	Programme elements (settings)	Programme duration	Follow-up after post-test	Child behaviour outcomes*
Universal programmes						
Good Behavior Game[w48]	922 (USA)	Grade 1 (not applicable)	Child BT (school)	2 school years	14 years	↓ ASPD diagnoses
Triple P I[w49–w50]	280 (Germany)	3–6 years (not applicable)	Parent training (community)	1 month	3.9 years	↓ 2 of 8 symptoms
					11 months	• 1 of 1 symptom
Triple P II alone	1675 (Switzerland)	Grade 1—*Triple P II* (not applicable)	Parent training (community)	1 month	8 years	↓ 2 of 7 symptoms†
PATHS alone		Grade 2—PATHS (not applicable)	Child SST (school)	1 school year	7 years	• 7 of 7 symptoms†
Triple P II+PATHS[w51–w52]		As above	As above	As above	7 years	• 7 of 7 symptoms†
Targeted programmes						
Classroom-Centered Intervention‡	653 (USA)	Grade 1 (low income)	Child enriched curriculum, child SST+child BT (school)	1 school year	5–11 years§	↓ 1 of 1 symptom
					5 years	↓ CD diagnoses ↓ 2 of 2 symptoms
Family School Partnership[w53-w54]			Parent training+parent-school collaboration (school)		5–11 years§	↓ 1 of 1 symptom
					5 years	• CD diagnoses ↓ 2 of 2 symptoms
Chicago Parent Program[w55]	504 (USA)	2–4 years (low income)	Parent training (community)	2.8 months	1 year	↓ 2 of 4 symptoms
Coping Power[w56–w58¶]	245 (USA)	Grade 5 (behaviour problems)	Parent training+child CBT (school)	2 school years	3.5 years	↓ 1 of 1 symptom
					1 year	↓ 1 of 1 symptom**
Family Check-Up[w59–w62]	731 (USA)	2 years (behaviour problems, maternal challenges +/or low SES)	Parent training (home)	4.3 years	4.2 years	• 1 of 1 symptom
					2.2 years	↓ 1 of 1 symptom
Fast Track[w63–w64††]	891 (USA)	Grade 1 (behaviour problems)	Parent training, child SST+child tutoring (school, community, home)	10 school years	8 years	↓ ASPD diagnoses ↓ 2 of 5 symptoms**
					2 years	• ODD/CD diagnoses
Incredible Years Basic[w65]	153 (UK)	3–4 years (behaviour problems)	Parent training (community)	2.8 months	3.2 months	↓ 2 of 4 symptoms
Incredible Years Basic+Literacy[w66]	174 (UK)	5–6 years (low income)	Parent training+child literacy training (community)	4.1 months	7.9 months	• 4 of 4 symptoms
Incredible Years Enhanced[w67]	92 (USA)	2–5 years (sibling in justice system)	Parent training (community, home)	9–11 months	8 months	↓ 1 of 2 symptoms
Montreal Prevention Program[w68 w69]	250 (Canada)	Grade 2 (boys with behaviour problems)	Child SST, child BT, parent training+teacher training (school, home)	2 school years	19 years	• 1 of 1 symptom
					15 years	• 1 of 1 symptom
Nurse-Family Partnership[w70]	400 (USA)	Prenatal (low income, first-time mothers)	Parent training (home)	26 months (average)	13 years	↓ 3 of 14 symptoms**
Parent-Management Training—Oregon[w71]	238 (USA)	6–10 years (boys living with recently separated mothers)	Parent training (community)	3.2 months	8.7 years	↓ 3 of 3 symptoms**
Perry Preschool[w72]	128 (USA)	3–4 years (low income+low IQ)	Child enriched curriculum+parent-school collaboration (community, home)	16 months	35 years	↓ 2 of 9 symptoms**
REDI[w73–w75††]	356 (USA)	4 years (low income)	Child SST, child literacy training+teacher training (community)	4 months	4 years	• 1 of 1 symptom
					1 year	↓ 2 of 2 symptoms

↓ denotes statistically significant reductions in diagnoses/symptoms; • denotes no significant differences between intervention and control groups.

* Diagnostic findings extracted for all follow-up periods and symptom findings extracted for either longest follow-up period or for two follow-up periods when needed to meet criterion of reporting on 2 or more behaviour symptoms (including one that was blinded).

†Outcome measure completed by teachers during earlier follow-up was blinded so assumed later blinding as well.

‡*Good Behavior Game* included in *Classroom-Centered Intervention*.

§Analysis included follow-up ranging from 5 to 11 years.

¶Of 245 children, 123 also received a universal intervention (*Coping with Middle School Transitions*); outcomes only reported for *Coping Power* (targeted) because it alone met criteria.

**Reductions included particularly serious symptoms such as criminal activities, arrests, days incarcerated.

††PATHS included in both *Fast Track* and *REDI*.

ASPD, antisocial personality disorder; BT, behaviour training; CBT, cognitive-behavioural training; CD, conduct disorder; ODD, oppositional defiant disorder; PATHS, Promoting Alternative Thinking Strategies; REDI, Research-Based Developmentally Informed; SES, socioeconomic status; SST, social skills training.

compared with psychosocial studies. Nevertheless, even though many outcome measures for the prevention and psychosocial treatment RCTs were not blinded, a further audit found that more of the blinded outcomes were statistically significant than the non-blinded (42.9% vs 31.5%, respectively), suggesting that the lack of blinding did not create a bias favouring these types of interventions. Please see the online supplementary appendix for risk-of-bias assessments for individual RCTs.

CONCLUSION AND CLINICAL IMPLICATIONS

Childhood ODD and CD incur high individual and collective costs, in part because effective prevention and psychosocial treatment interventions are not made widely available. Conducted to encourage improvements in policy and practice, this systematic review identified 37 RCTs evaluating 15 prevention programmes, 8 psychosocial treatments and 5 pharmacological treatments. For prevention, 3 programmes reduced behavioural diagnoses (*Classroom-Centered Intervention; Good Behavior Game* and *Fast Track*) while 5 programmes reduced serious behaviour symptoms such as criminal activity (*Coping Power; Fast Track; Nurse-Family Partnership, Parent Management Training–Oregon* and *Perry Preschool*). Prevention benefits were long term, up to 35 years. For psychosocial treatment, 1 intervention reduced behavioural diagnoses (*Incredible Years*) while 3 interventions reduced criminal activity (*Brief Intervention;*

Table 3 Psychosocial treatment descriptions and evaluation findings

Programme	Sample size (country)	Ages at programme start	Programme elements (settings)	Treatment duration	Follow-up after post-test	Child behaviour outcomes*
Brief Intervention— Youth only	300 (USA)	11–17 years	Child CBT (home)	2 weeks	2 years	↓ 1 of 1 symptom†
					1.5 years	• 2 of 2 symptoms
Brief Intervention— Youth+Parent[w76]			Child CBT+Parent training (home)	3 weeks	2 years	• 1 of 1 symptom
					1.5 years	• 2 of 2 symptoms
Incredible Years Basic[w77–w78]	120 (UK)	3–7 years	Parent training (clinic)	3–3.7 months	7.8 years (average)	↓ ODD diagnoses ↓ 1 of 3 symptoms
Incredible Years Basic+Literacy[w77–w79]	112 (UK)	4–6 years	Parent training+child literacy training (community, home)	6.4 months	5.8 years (average)	• ODD diagnoses • 3 of 3 symptoms
					4 months	↓ ODD diagnoses
Multidimensional Treatment Foster Care I[w80–w81]‡	79 (USA)	12–17 years (boys only)	Parent training, child SST, family therapy (home, community)	6.8 months (average)	1.4 years (average)	↓ 2 of 2 symptoms†
Multidimensional Treatment Foster Care II[w82]‡	81 (USA)	13–17 years (girls only)	Parent training, child SST, family therapy (home, community)	5.7 months (average)	1.4 years (average)	↓ 1 of 3 symptoms†
Multisystemic Therapy I[w83]‡,§	118 (USA)	12–17 years	Parent training, child CBT, family therapy (home, community)	4.3 months (average)	6 months	• 2 of 2 symptoms
Multisystemic Therapy II[w84]‡	131 (USA)	11–17 years	Parent training, child CBT, family therapy (home, community)	7 months (average)	1.4 years (average)	↓ 1 of 2 symptoms†
Multisystemic Therapy III[w85–w86]	164 (USA)	11–18 years	Parent training, child CBT, family therapy (home, community+school)	5.2 months (average)	2 years	• 2 of 2 symptoms
					1 year	↓ 2 of 4 symptoms
Multisystemic Therapy IV[w87–w89]	256 (Netherlands)	12–18 years	Parent training, child CBT, family therapy (home, community)	5.7 months (average)	2.8 years (average)	• 1 of 1 symptom
					7.2 months (average)	↓ 5 of 6 symptoms†
Parent-Child Interaction Therapy[w90]	81 (Norway)	2–7 years	Parent training (clinic)	4.9 months (average)	1.1 years (average)	↓ 2 of 5 symptoms
Parent Management Training– Oregon[w91]	112 (Norway)	4–12 years	Parent training (community)	6.1 months (average)	1.1 years (average)	• 7 of 7 symptoms
Protocol for On-Site Nurse-Administered Intervention[w92]	163 (USA)	6–11 years	Parent training, child CBT, family therapy (clinic)	4 months (average)	1 year	• ODD/CD diagnoses • 1 of 1 symptom
Strongest Families[w93]¶	80 (Canada)	3–7 years	Parent training¶ (home)	3.2 months	5.2 months	• ODD diagnoses

↓denotes statistically significant reductions in diagnoses/symptoms; •denotes no significant differences between intervention and control groups.

*Diagnostic findings extracted for all follow-up periods and symptom findings extracted for either longest follow-up period or for 2 follow-up periods when needed to meet criterion of reporting on two or more behaviour symptoms (including one that was blinded).

†Reductions included particularly serious behaviour symptoms, including criminal activities, arrests and days incarcerated.

‡All youth had prior justice system involvement.

§All youth also met diagnostic criteria for a substance use disorder.

¶Intervention predominantly self-delivered using handbooks and videos supplemented with weekly telephone coaching.

CD, conduct disorder; CBT, cognitive-behavioural training; ODD, oppositional defiant disorder; SST, social skills training.

Multidimensional Treatment Foster Care and *Multisystemic Therapy*). Psychosocial treatment benefits lasted from 1 to 8 years. Meanwhile, 4 medications, mainly antipsychotics, reduced post-test symptoms, yet all caused important adverse events.

We believe that this review makes a unique contribution to informing policy and practice by covering a *comprehensive* array of options for children—spanning both prevention and treatment, spanning both psychosocial and pharmacological interventions, and spanning developmental stages from prenatal through adolescence. By presenting this 'big picture', we hope to encourage policymakers and practitioners to implement effective interventions and to encourage them to consider the full array of options, thereby interrupting the planning and service fragmentation and gaps that can arise when only prevention or only treatment or only specific intervention types or only selected ages are considered. Our review also specifically updates a previous comprehensive review of ODD/CD interventions[27] by covering a wider range of search years, encompassing studies that are both older and newer. We also believe that we have complemented previous reviews that had more narrow foci such as examining only prevention;[28] only treatment[29] or only specific intervention types.[30–33]

Yet our review has limitations. We only reported on outcomes directly pertaining to ODD/CD. However, several prevention programmes showed other important benefits including: reducing child maltreatment (*Nurse-Family Partnership*);[35] reducing child suicidal ideation (*Good Behavior Game*)[36] and improving adult employment (*Perry Preschool*).[37] Likewise, some psychosocial treatments showed other benefits such as reducing substance use (*Multisystemic Therapy*)[38] and reducing attention-deficit symptoms (*Strongest Families*).[39] Another limitation pertains to the lack of attention in the prevention and psychosocial treatment studies to the issue of possible adverse effects. For example, interventions such as *Nurse-Family Partnership* entail greater family scrutiny, which may lead to adverse effects (from the family's perspective) such as additional child protection reporting; likewise, targeted programmes entail identifying children at risk, which may lead to potential stigma. Future prevention and psychosocial treatment research should attend to these issues. Our inclusion criteria for blinding also differed between psychosocial and medication studies, which may introduce bias favouring psychosocial studies. We took this approach to allow us to include a reasonable number of psychosocial intervention studies, where double blinding (and placebo controls) may not be feasible. As well, we required

Table 4 Pharmacological treatment descriptions and evaluation findings

Medication (daily dose)*	Sample size (country)	Ages at post-test	Duration (setting)	Child behaviour outcomes	Child adverse events†
Carbamazepine (400–800 mg)[w94]	24 (USA)	5–11 years	6 weeks (hospital)	• 5 of 5 symptoms	Weight gain 77%; dizziness 54%; headache 46%; leucopenia 46%; rash 46%; diplopia 38%; drowsiness 31%; nausea 31%; left study due to adverse events 8%
Haloperidol (1–12 mg)	64 (USA)	5–12 years	4 weeks (hospital)	↓ 5 of 6 symptoms‡	Any adverse event 100%; sedation 80%; dystonia 50%; drooling 30%; tremor 25%; left study due to adverse events not reported
Lithium (500–2000 mg)[w95]				↓ 5 of 6 symptoms‡	Any adverse event 81%; weight gain not reported§; abdominal pain 33%; headache 29%; left study due to adverse events not reported
Lithium (600–2100 mg)[w96]	55 (USA)	5–12 years	6 weeks (hospital)	↓ 3 of 6 symptoms	Weight gain 76%; vomiting 48%; abdominal pain 32%; tremor 28%; left study due to adverse events not reported
Lithium (900–2100 mg)[w97]	40 (USA)	9–17 years	4 weeks (hospital)	↓ 3 of 3 symptoms	Weight gain 85%; nausea 60%; excessive thirst 60%; urinary frequency 55%¶; vomiting 55%¶; abdominal pain 35%; headache 30%; tremor 25%; left study due to adverse events 0%
Quetiapine (200–600 mg)[w98]	19 (USA)	12–17 years	6 weeks (clinic)	↓ 2 of 4 symptoms	Irritability 78%; restlessness 78%; agitation 67%; anxiety 67%; sedation 67%; pacing 44%; social withdrawal 44%; reduced energy 33%; reduced alertness 33%; weight gain 33%; tachycardia not reported¶; left study due to adverse events 11%
Risperidone** (1.5–4 mg)[w99]	38 (Netherlands)	12–18 years††	6 weeks (hospital)	↓ 1 of 3 symptoms	Fatigue 58%; physical slowing 26%; problems swallowing or talking 21%¶ ; increased prolactin levels not reported*; weight gain not reported¶; left study due to adverse events 0%
Risperidone (0.75–1.5 mg)[w100]	20 (USA)	6–14 years	10 weeks (clinic)	↓ 5 of 6 symptoms	Any side effect 80%; weight gain not reported¶; increased appetite 30%; sedation 30%; left study due to adverse events 10%
Risperidone** (1.2 mg)‡‡[w101]	119 (USA)	5–12 years††	6 weeks (clinic)	↓ 3 of 3 symptoms	Any side effect 98%; sedation 51%¶; headache 29%; weight gain 15%¶; increased prolactin levels 13%¶ §§; left study due to adverse events 4%

• denotes no significant differences between intervention and placebo control groups; ↓ statistically significant reductions in symptoms.

*Reported doses include widest range that children received; dosing is not equivalent across medications.

†Adverse events only reported where ≥25% of children were affected or where significantly more children on medication versus placebo were affected; not all studies assessed whether medication and placebo adverse events differed significantly.

‡In addition to both lithium and haloperidol showing significant symptom reductions over placebo on 5 of 6 measures, lithium showed significant benefits over haloperidol on 1 symptom measure.

§While authors did not report proportion of children experiencing weight gain, they noted that it was considerable (ranging from means of 31.7–35.0 kg).

¶Adverse events experienced by significantly more children on medication than placebo.

**All children had below-average IQs.

††Ages reflect children eligible for the study.

‡‡Average daily dose; range not reported.

§§Significantly more boys (but not girls) experienced increased prolactin levels on medication versus placebo.

that psychosocial interventions have follow-up after post-test of at least 3 months, while only requiring post-test follow-up for medications. Still, risk-of-bias assessment for all included studies nevertheless confirmed more favourable profiles for medication compared with psychosocial studies, as acknowledged in the findings. Yet another limitation may arise from setting high thresholds for study inclusion. As a result, we do not discuss myriad interventions where we did not find RCT evaluations even though these interventions are likely being used—including some that may be ineffective. That said, we hope that our approach may serve as a pragmatic model for policymakers and practitioners. Namely, when interventions are lacking RCT evidence of effectiveness, they should only be used if there is a commitment to evaluating outcomes to ascertain the benefits for children.

Based on this review, the case for prevention appears to be particularly strong—with 13 programmes showing positive findings, many at long-term follow-up. Most successful programmes focused on children at risk, suggesting that targeted approaches may be particularly beneficial in ameliorating early adversities, arguably even constituting a form of 'proportionate universalism'.[40] Many, furthermore, focused on the early years, suggesting greater benefits with 'upstream' approaches. Parent training was also a central feature of many successful programmes, suggesting that supporting parents is crucial.

Beyond positive child outcomes, US cost analyses have also been favourable for several effective prevention programmes, suggesting that they may pay for themselves. These US evaluations have factored in intervention costs as well as estimates of reduced additional service use across multiple sectors over 10–15 years or more—including criminal justice, social services, education and healthcare. Net benefits per participant have been suggested for: *Good Behavior Game* (US$10 800, 2017 equivalency); *Nurse-Family Partnership* (US$5 100, 2017 equivalency) and *Parent Management Training–Oregon* (US$5 700, 2017 equivalency).[12] *Fast Track* was also estimated to be cost-effective but only for the highest-risk children.[41] For *Perry Preschool*, meanwhile, US estimates have suggested returns of 6–13 dollars for every programme

dollar invested.[42] Estimates will vary according to countries and methods used; such estimates may nevertheless be helpful in encouraging more widespread adoption of effective prevention programmes.

Yet even if effective prevention programmes are made widely available, they could not avert all new ODD or CD cases. Treatment will always be needed. According to this review, *Incredible Years* was notable for reducing ODD diagnoses, while *Brief Intervention, Multidimensional Treatment Foster Care* and *Multisystemic Therapy* reduced criminal activity. Psychosocial treatment benefits lasted from 1 to 8 years—considerable time in the life of a child. US cost analyses were also favourable for one effective programme: *Multidimensional Treatment Foster Care*. Factoring in programme costs as well as estimated lifetime reductions in the use of additional criminal justice, social, education and healthcare services, net benefits per participant have been suggested (US$9 400, 2017 equivalency).[12] (Costs analyses were also available for *Incredible Years* but none exclusively focused on the RCTs we reviewed.) Yet with only 5 psychosocial treatments showing effectiveness, new research is needed to delineate more options. We also concur with previous reviewers who have noted the modest effect sizes for most psychosocial treatments for ODD/CD, especially when treatments begin when children are older[33]—such that more research is warranted, particularly with younger age groups.

In comparison, in the medication studies we reviewed, child benefits were short-term and frequently associated with important adverse events. Some of these adverse events were fairly rare and could likely be managed clinically. Yet these findings are still concerning given well-documented overprescribing to children[23–26]—in a context where effective prevention programmes and psychosocial treatments are not widely available.[16 43] As well, prescriptions for behaviour problems have often involved 'off label' use—raising additional risks for children.[44] The lack of long-term follow-up studies on these medications is a further cause for concern given the evidence amassing on cardiovascular, cognitive and other harms associated with the long-term use of antipsychotics such as risperidone and quetiapine in children.[26 45] More research is therefore needed on pharmacological treatments for childhood ODD/CD, better delineating long-term risks and benefits.

On balance, most of the research evidence that we identified favours prevention. Yet substantial hurdles need to be overcome to implement this evidence. Foremost, in many wealthy countries, most health spending goes towards providing healthcare after problems are established. In the UK and Canada, for example, only approximately 5% of overall health spending is allocated to public health including prevention.[17 19] Policymakers will need to take concerted leadership to shift these spending patterns, even by modest amounts. Yet some countries are excelling at improving children's mental health services, showing that the shortfalls and imbalances can be addressed. Australia, for example, has doubled the proportion of children with mental disorders who are receiving services—from one-third in 1998 to two-thirds in 2014—by making significant new prevention and treatment investments.[46] Beyond this, many prevention programmes require cross-sectoral collaboration for effective implementation. For instance, *Classroom-Centered Intervention, Good Behavior Game* and *Fast Track* were delivered in schools, involving teachers, while *Nurse-Family Partnership* was delivered in homes, involving public-health nurses. So novel collaborations among children's mental health agencies, public health agencies, schools and others will need to be established and sustained where these do not exist.

Making prevention a priority while ensuring the availability of effective treatments will also require concerted efforts from practitioner groups. Physicians—and their professional regulatory bodies—could take leadership in addressing medication overprescribing. Physicians as well as other practitioner groups including psychologists, social workers, nurses, teachers, child protection workers and school counsellors could engage in promoting effective prevention and psychosocial interventions for ODD/CD. All practitioner groups could also take leadership in embracing intervention models that move the children's mental health field away from focussing only on individual approaches, reaching just one child at a time, towards *also* reaching many more children through population-level interventions, such as the effective prevention programmes highlighted here. Policymakers can assist with these efforts by funding effective interventions and by supporting practitioners to provide these.

Considerable RCT evidence favours prevention, according to this review. Effective prevention programmes should therefore be made widely available. Effective psychosocial treatments should also be provided for all children with ODD/CD. But medications should be a last resort given associated adverse events and only short-term evidence of benefits. While more research is needed, particularly on psychosocial interventions and on medications, policymakers and practitioners can nevertheless help children by acting on these findings now. Yet the aim is not to favour only prevention programmes, but rather, to achieve a balance of public investments—in effective interventions across the prevention and treatment continuum, so that all children in need are reached. The well-being of children and of populations is in the balance.

► References 48-104 will appear online only, and can be found in the supplementary appendix.

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► Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/eb-2017-102862).

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