BMJ Open

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Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-046091
Article Type:	Protocol
Date Submitted by the Author:	20-Oct-2020
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Keywords:	Child & adolescent psychiatry < PSYCHIATRY, MENTAL HEALTH, Impulse control disorders < PSYCHIATRY

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Comparative efficacy and acceptability of psychosocial treatments for conduct disorder problems in children and adolescents: study protocol for a systematic review and network meta-analysis

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Word count: 3392

Keywords: conduct disorder, psychosocial treatment, children and adolescents, network meta-analysis, protocol

ABSTRACT

Introduction Conduct disorder problems are common among children and adolescents, with negative impacts on the youths, their families, and society. Although multiple psychosocial treatments have been proven to be effective for conduct disorder problems, comprehensive evidence regarding the comparative efficacy and acceptability between these treatments is still lacking. Therefore, we propose a systematic review and network meta-analysis, integrating both direct and indirect comparisons to obtain a hierarchy of treatment efficacy and acceptability.

Methods and analysis The present protocol will be reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols. Ten databases, including Web of Science, PubMed, PsycINFO, MEDLINE, APA PsycArticles, Psychology and Behavioral Sciences Collection, OpenDissertations, The Cochrane Library, Embase, and CINAHL, will be searched from inception for randomized controlled trials of psychosocial treatments for children and adolescents with conduct disorder problems, regardless of language, publication year and publication status. The primary outcomes will be efficacy at post-treatment (severity of conduct disorder problems at post-treatment) and acceptability (dropout rate for any reason) of psychosocial treatments. The secondary outcomes will include efficacy at follow-up, severity of internalizing problems, and improvement of social functioning. Two authors will independently conduct the study selection and data extraction, assess the risk of bias using the revised Cochrane Collaboration's Risk of Bias tool, and evaluate the quality of the evidence using the Grading of Recommendations Assessment, Development and Evaluation framework to network meta-analysis. We will perform Bayesian network meta-analyses with random-effects model. Subgroup and sensitivity analyses will be performed to evaluate the robustness of the findings.

Ethics and dissemination The research does not require ethical approval. Results are planned to be published in journals or presented at conferences. The network meta-analysis will provide information on a hierarchy of treatment efficacy and

acceptability and help make a clinical treatment choice.

PROSPERO registration number CRD42020197448

Strengths and limitations of this study

Bayesian network meta-analysis can synthesize all direct and indirect evidence and allows the comparison of multiple treatments simultaneously within a single analysis, which is beneficial for clinical practitioners to make an optimal and evidence-based decision on the treatment of conduct disorder problems.

The present study focuses on psychosocial treatment types rather than delivery conditions for treating conduct disorder problems, which contributes to filling the lack of comprehensive comparisons between psychosocial treatment types.

We will not exclude trials with participants suffering conduct disorder problems comorbid with attention deficit and hyperactivity disorder. Although results will reflect the real situation and contribute to more generalizable inferences, the risk of bias for outcomes will be raised.

BACKGROUND

Conduct disorder problems (CDPs), which include conduct disorder (CD) and other related behavior problems in the clinical range (e.g. oppositional defiant disorder.),[1] are common mental and behavioral problems among children and adolescents (more common in boys than in girls), affecting more than 50 million children and adolescents worldwide according to the survey by Global Burden of Disease Study 2013 Collaborators.[2] As addressed in the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), CD is characterized by repetitive and persistent patterns of antisocial, aggressive, or rule-breaking behavior.[3] Patients with CD have a high rate of comorbidity with other mental health problems such as attention deficit hyperactivity disorder (ADHD).[4] CD is costly, and can persist over time and bring

about many serious consequences to the individual, school, family, and society, including bad health conditions, poor school performance, social disadvantage, family conflicts, and criminal behaviors.[5] Besides, untreated CD not only can influence the functioning and quality of life of children and adolescents during their childhood and adolescence but also may develop into antisocial personality in their adulthood.[6] On the contrary, an effective treatment could save 128 disability-adjusted life years (DALY) per 100,000 boys and 90 DALY per 100,000 girls in the United States.[7] Given the adverse influence of CDPs and the benefits of effective treatment, researchers and practitioners have devoted their efforts to providing professional treatments effectively and timely to children and adolescents with CDPs.

Several disciplines, such as developmental psychopathology, child psychiatry, and social psychology, have contributed to understanding the course, causes, and development of CDPs, and have yielded different perspectives for treating CDPs. Among the evidence-based interventions, psychosocial treatment is an important approach for treating CDPs, taking priority over the pharmacological treatment. Although some medications (e.g. risperidone) may have beneficial effects for CDPs, they have side effects and are not suggested for routine management.[4] Evidence from previous meta-analyses indicated that psychosocial treatment can significantly improve CDPs,[1 8 9] thence, this study focuses on psychosocial treatment for youth with CDPs. To date, there are many types of psychosocial treatments available for treating CDPs, such as behavior therapy (BT),[10] cognitive-behavioral therapy (CBT),[11] psychodynamic therapy (DYN),[12] and play therapy (PT).[13] These psychosocial treatments can be delivered with diverse conditions, including parent training programs, foster carer/guardian training programs, child-focused programs, multimodal interventions.[4] Regarding the suitable delivery conditions for different age groups, National Institute for Health and Care Excellence (NICE) has recommended (1) parent and foster carer or guardian training programs or (2) child-focused programs or (3) parent and child training programs, for children and adolescents with CDPs aged 3-14. Meanwhile, for children and adolescents aged 11-17 NICE has

recommended multimodal interventions. Previous research has not checked the comparative effectiveness of all the psychosocial treatment types yet, therefore, the current research will focus mainly on treatment types rather than delivery conditions unless there are enough numbers of included trials to distinguish between them. Another concern for psychotherapists, psychological counselors, and social workers is the acceptability of these psychosocial treatments. Some treatments are not easily accepted by participants due to high demands, long durations, stigmatization, etc., even though they can be effective for children and adolescents with CDPs.[14] Besides, due to methodological restrictions of conventional meta-analyses, it is still unclear which are the most efficacious and the most acceptable psychosocial treatments for CDPs. Fully investigating the comparative effectiveness and acceptability of all psychosocial treatments is beneficial for clinical practitioners to make an optimal and evidence-based decision on the treatment of CDPs.

Network meta-analysis (NMA), which can consider both direct (head-to-head comparison) and indirect (comparison of treatments via a common comparator) evidence, is an appropriate method to answer the questions above.[15] The standard pairwise meta-analysis cannot be used to assess relative effects across treatments if the comparisons have not been evaluated in head-to-head trials. Instead, NMA allows comparison of multiple treatments simultaneously within a single analysis as long as every treatment is connected to at least one of the other treatments under evaluation through direct comparisons.[16] Some researchers have compared the efficacy of psychotherapies or psychosocial therapies for the treatment of depression,[17] acute anxiety disorders,[18] post-traumatic stress disorders (PTSD)[19] in children and adolescents. One NMA has investigated the comparative effects of psychosocial and pharmacologic interventions for disruptive behavior in children and adolescents.[20] However, the previous NMA grouped the same delivery conditions of psychosocial interventions (i.e. child component, parent component, and multi-component) into a node. With an increasing body of research investigating the effectiveness of treatment for CDPs, it is possible to group the same types of psychosocial treatments into a node

and conduct NMA. Besides, the previous research has not explicitly made a distinction between prevention and treatment, though their backgrounds, places, and intervention methods are different.[21] Therefore, the present protocol aims to address the above limitations and synthesize all direct and indirect evidence for identifying the optimal psychosocial treatment for children and adolescents with CDPs.

OBJECTIVES

The purpose of this study is to evaluate and compare the effectiveness and acceptability of psychosocial treatments for CDPs. Specifically, we aim to

1. assess the relative psychosocial treatment effects at post-treatment for CDPs, in comparison to one another.

2. determine the acceptability of these psychosocial treatments.

3. assess the relative psychosocial treatment effects at follow-up for CDPs, in comparison to one another.

4. compare the effectiveness of psychosocial treatments on the improvement of internalizing problem outcomes at post-treatment in children and adolescents with CDPs.

5. compare the effectiveness of psychosocial treatments on the improvement of social functioning outcomes at post-treatment in children and adolescents with CDPs.

METHODS AND ANALYSIS

The systematic review and NMA is registered in the PROSPERO database (registration number: CRD42020197448) and has been developed according to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) checklist, the extension statement for NMA (PRISMA-NMA), and

proposed additional considerations for protocols of systematic reviews including NMA[22-24].

Eligibility criteria

Study design

All randomized controlled trials (RCTs), including cluster RCTs and first phase of cross-over studies, will be included. Quasi-randomized trials (e.g. randomization by the last number of the date of birth, or day of the week) will be excluded. Moreover, trials will be excluded if the sample size is less than 10 per study. Because the psychosocial treatments are difficult to be conducted in a double-blind design, we will include single-blind RCTs (i.e. raters were blinded) or trails in which participants were assessed by self-rating scales. Language, year of publication, publication status will not be restricted.

Types of participants

Children and adolescents with CDPs, who were no more than 18 years old when they initially enrolled in studies, will be included. We will follow broad criteria to identify CDPs: (1) diagnosed as CD, oppositional defiant disorder (ODD) or disruptive behavior disorder (DBD), in accordance with diagnostic interviews on the basis of the Diagnostic and Statistical Manual (DSM) or the International Classification of Diseases (ICD), or (2) clinically significant symptoms of CDPs, defined as scoring no less than a clinical cut-off measured by a standardized rating scale on CDPs. The common scales measuring CDPs and their clinical cut-off values are shown in Table 1. Trials in which participants have a secondary diagnosis of comorbid psychiatric disorders (autism spectrum disorder, depressive disorder, anxiety disorder, etc.), or intellectual, or neurological, or physical disability will be excluded. It is noteworthy that trials in which participants have comorbidity with ADHD will be included. All treatment settings (i.e. outpatient, inpatient services, community clinics, and schools)

will be included.

Table 1 Hierarchy of CDPs severity scales and their clinical cut-off values

Hierarchy	Scales	Abbreviation	Clinical Range
1	Eyberg Child Behavior Inventory	ECBI	Norway version: > 90th percentile US version: > 15 for the Problem score scale or/and > 131 for the Intensity score scale (> 93th percentile)
2	Achenbach System of Empirically Based Assessment	ASEBA	> 98th percentile (T score > 70) for oppositional defiant problems or conduct problems in DSM-oriented scales, or for rule-breaking behavior or aggressive behavior syndrome scale scores, or for externalizing problems scores
3	Strengths and Difficulties Questionnaire	SDQ	conduct problems subscale score > 5
4	Behavior Assessment System for Children	BASC	T score > 70 for externalizing problems subscale
5	Revised Behavior Problem Checklist	RBPC	T score > 70 for conduct disorder subscale
6	Conners Rating Scales	CRS	T score ≥ 65 for defiance/aggression scale and symptom count at or above DSM cut-off score

Types of treatments

According to NICE guidelines, psychosocial interventions for CDPs can be delivered through parent training programs, parent and child training programs for children with complex needs, foster carer/guardian training programs, child-focused programs, and multimodal interventions.[4] Psychosocial interventions are categorized according to the delivery conditions but not treatment types. Table S1 shows descriptions and examples of common psychosocial treatment types and control conditions on the topic.

The effects of many types of psychosocial treatments on CDPs have been explored in several reviews, traditional meta-analyses, or RCTs. Because CBT is the most common treatment type for CDPs, CBT with different delivery conditions may be separated as independent nodes if data are available. For the other treatment types, trials comparing the same treatment types will be grouped into the same node no matter which delivery conditions they used. Control groups include no treatment, waitlist, and treatment as usual.

Types of outcome measures

Primary outcomes

1. Efficacy at post-treatment, measured using the end-point score (at post-treatment) from scales assessing the severity of CDPs.[25] Where multiple scales are reported, we will extract data from the CSPs severity scales in a hierarchical fashion (table 1). Besides, when multiple raters report a CSPs severity scale, the most preferable data for inclusion will be the self-rated outcome, followed by parent/guardian rated outcome, or if not available, teacher, clinician, or researcher rated outcome.

2. Acceptability of psychosocial treatment, defined as the dropout rate for any reason during psychological treatments.

Secondary outcomes

1. Efficacy at follow up, measured by the score from CDPs severity scales at the 6-month follow up, or if not available, measured by the score nearest 6-month follow-up.

2. Internalizing problems, measured by the end-point score (at post-treatment) from internalizing problem scales, such as Achenbach System of Empirically Based Assessment (i.e. Child Behavior Checklist, Teacher's Report Form and Youth Self-Report), Revised Behavior Problem Checklist, Child and Adolescent

Functional Assessment Scale, Revised Children's Manifest Anxiety Scale, State Trait Anxiety Inventory for Children, Beck Depression Inventory, Children's Depression Rating Scale Revised, Hamilton Depression Rating Scale. If the above scales are not available, other valid scales on internalizing problems will be used.

3. Social functioning, measured by the end-point score (at post-treatment) from social functioning scales, such as Children's Global Assessment Scale, Social Competence Inventory, Matson Evaluation of Social Skills with Youngsters, School Social Behavior Scales, Social Skills Improvement System Rating Scales. If the above scales are not available, other valid scales on social functioning will be used.

Search strategy

Ten electronic databases, including Web of Science, PubMed, PsycINFO, MEDLINE, APA PsycArticles, Psychology and Behavioral Sciences Collection, Open Dissertations, The Cochrane Library, Embase, and CINAHL will be searched without restriction on language, publication status, or publication period. We take Web of Science as an example, the following search terms are applied:

TS=("conduct problem*" OR "conduct disorder*" OR "oppositional behavior*" OR "oppositional behaviour*" OR "oppositional defiant disorder*" OR "externalizing behavior*" OR "externalizing behaviour*" OR "externalizing disorder*" OR "disruptive behavior disorder*" OR "disruptive behaviour disorder*" OR "disruptive behavior*" OR "disruptive behaviour*")

AND TS=(youth* OR child* OR adolescent* OR juvenile* OR boy* OR girl* OR parent* OR teenage*)

AND TS=(intervention OR therapy OR treatment OR evaluation OR "randomized controlled trial" OR "controlled clinical trial" OR effectiveness OR efficacy OR "controlled trial" OR randomized OR trial)

NOT TS=(animal*)

NOT TS=(pharmacolo*)

In order not to omit any relevant research, we will search eligible studies of reviews and meta-analyses on related topics, and further search reference lists of all eligible studies manually. Moreover, we will contact the corresponding author to complement incomplete data.

Selection of studies and data extraction

All results generated from systematic searches will be imported in Noteexpress and duplicates will be excluded. Two independent authors will identify initially 10% of studies from the titles and abstracts according to the predefined eligibility criteria for ensuring consistency. If a high level of inconsistency occurs, the eligibility criteria of the studies will be clarified through a discussion with a senior researcher. If there is a high degree of consistency, all potentially eligible articles will be identified from titles and abstracts by the two authors independently and disagreements will be resolved by a senior researcher. Then, all full-text potentially eligible articles will be obtained and screened by the two independent authors according to the same criteria and disagreements will be resolved as aforementioned. Additional information will be obtained from study authors if required. Reasons for exclusion for each trial will be reported at the stage of full-text screening. Finally, the process of study selection will be shown by using a PRISMA flow chart.

Data extraction

The following data will be extracted by two authors independently from all selected trials and disagreements will be resolved by a senior researcher if required.

Study characteristics include study title, study authors, publication year, publication type, publication journal, country and source of funding, study design, randomization,

and blinding.

Participant characteristics include age, gender, race/ethnicity (if it was reported in the study), socioeconomic status (if it was reported in the study), sample size, diagnostic criteria for CDPs, comorbidities, and the total number of participants.

Intervention characteristics include the type of psychosocial therapy, delivery conditions (parent training program, parent and child training program for children with complex needs, foster carer/guardian training program, child-focused program, or multimodal interventions), delivery medium (Internet-based or face-to-face), delivery format (group, individual or group plus individual), treatment setting, duration of a session, number of sessions, frequency of treatment, length of treatment, people who delivered the treatment, follow-up duration, and co-interventions.

Outcome measures include scores of mean and standard deviation, number of participants, and people who rated the outcome (i.e. children, parents, teachers, clinicians, or researchers) for each predefined outcome.

Adherence measures include the total number of subjects at pre- and post-treatment and at follow-up measurements, and reasons for attrition to treatment.

Data at the closest time point to six-month follow-up will be extracted if data for multiple follow-up time points were provided in the studies. We will contact the corresponding authors by sending emails if any information that we want to extract was not provided in their studies.

Risk of bias assessment

The risk of bias assessment will be assessed by two authors independently according to the revised Cochrane Collaboration's risk of bias tool (RoB 2.0) for RCTs.[26] Any disagreement will be resolved by a senior researcher if required. The overall risk of bias will be rated as 'low risk' (i.e. low risk of bias in all domains), 'high risk' (i.e.

high risk of bias in at least one domain, or having some concerns in multiple domains), or 'some concerns' (i.e. having some concerns in at least one domain and no high risk of bias in any domain). Specifically, we will answer the signaling questions following available algorithms and judge the risk of bias as low, high, or some concerns for each domain: (1) bias deriving from the randomization process (e.g. sequence generation and allocation concealment), (2) bias arising from the blinding (e.g. blinding of participants and blinding of outcome assessors), (3) bias caused by incomplete outcome data, (4) bias due to the measurement of outcome and (5) bias due to the selective reporting. The result of the assessment of the risk of bias will be presented in a risk of bias summary graph.

Data analysis

Bayesian NMA with random-effects model will be performed by using WinBUGS V.1.4.3 to synthesize all evidence for each outcome. Compared with frequentist approach, Bayesian framework can benefit decision making, which can help create stable estimates and their credible intervals, which is further advantageous for making probabilistic statements and predictions on the treatment effects more straightforward.[27] Besides the Bayesian NMA, conventional pairwise meta-analyses with random-effects model will be employed for the comparison between active treatments and control arms by using Stata V.16. as a reference for the results of NMAs.

For continuous outcomes, standardized mean difference (SMD) will be used as a measurement of effect size. We will use published mean values and SDs, if not available, we will estimate values by conversion from SEs, *p* values, CIs, or t-values. We will contact the authors of the study to obtain information if none of the above values is provided in the published paper. If we cannot obtain the information using this approach, missing SDs will be derived from those of the other studies using a validated imputation technique.[28] For the dichotomous outcome, the risk ratio (RR) and its 95% CIs will be calculated as effect sizes. Missing data will be managed with

respect to the intention to treat (ITT) principle. Participants who drop out after randomization are regarded as non-responders.

In order to assess the transitivity assumption of NMA, we will assess the distribution of clinical and methodological variables.[29] Concerning clinical variables, we have assured the transitivity by limiting our samples to participants with CDPs and excluding participants with comorbid psychiatric disorders (autism spectrum disorder, depressive disorder, anxiety disorder, etc.), or intellectual, or neurological, or physical disability. Other clinical or methodological variables that may influence the efficacy of psychosocial treatments include age, number of sessions, length of treatment.

Heterogeneity will be assessed using the I^2 statistic and its 95% confidence interval (CI). For visualization, the overlap of the CIs will be shown with forest plots. For the NMA, we assume a common heterogeneity variance across the various treatment comparisons and assess it with τ^2. Possible reasons for heterogeneity will be examined by subgroup analysis.

Furthermore, we will assess the global inconsistency as well as local inconsistency. Global consistency will be evaluated by calculating the design-by-treatment interaction test. The local inconsistency will be evaluated by comparing the disagreement between direct and indirect evidence in evidence loops. The results of the inconsistency test will be interpreted with caution because the test is known to have low power.[30]

Finally, the surface under the cumulative ranking curve (SUCRA) and mean ranks will be used to summarize the probabilities of treatments and provide a hierarchy of competing treatments.

Subgroup analyses, meta-regression, and sensitivity analyses

If there are sufficient data in each subgroup, we will conduct a subgroup analysis to examine how treatment efficacy varies across different subgroups: (1) study setting

(clinic, school or community) and (2) outcome rater (child, parent, teacher, clinician or researcher). Besides, we will conduct network meta-regression meta-analyses of data on the outcome of efficacy at post-treatment to evaluate the influence of the following potential moderators: (1) age group, (2) number of sessions, and (3) length of treatment. Moreover, we will explore the sensitivity analyses by excluding: (1) studies in which missing data have been imputed, (2) studies in which high risk of bias rating have been assessed, and (3) studies in which participants comorbidity with ADHD have been included.

Publication bias

First, if ten or more studies are included in the NMA, funnel plots of pairwise NMAs will be examined. Moreover, comparison-adjusted funnel plots will be used to examine the association between study size and effect size. Furthermore, Egger's test will be used to examine the significance of publication bias.

Quality of the evidence

Grading of Recommendations Assessment, Development, and Evaluation framework specifically developed for NMA will be applied to evaluate the quality of evidence.[31] Specifically, we will characterize the credibility of a body of evidence on the basis of within-study bias, reporting bias, indirectness, imprecision, heterogeneity, and incoherence by using the CINeMA software.[32] The starting point for confidence in each network estimate is high but will be downgraded according to the assessments of the above six domains.

Ethics and dissemination

The NMA does not need ethical approval as no primary data are collected, and none human nor animal participants will be involved directly. Findings of the present research are planned to be published at national or international psychological conferences, or in a reputable scientific journal.

DISCUSSION AND SUMMARY

The systematic review and NMA will provide an overview and information on the comparative efficacy and acceptability of psychosocial treatments for children and adolescents with CDPs. The results will show a hierarchy of comparative efficacy with regard to symptoms of CDPs at post-treatment and follow-up, as well as in terms of acceptability, improvement of internalizing problems, and improvement of social functioning. To the best of our knowledge, this study will be the first NMA focusing on the treatment types rather than the delivery conditions in investigating the hierarchy of effectiveness and acceptability of psychosocial treatments for CDPs. The findings are expected to assist psychological counselors, psychotherapists, and social workers to make a better and evidence-based treatment choice.

It is worth noting that the findings need to be understood in light of study limitations. First, because of the fact that CDPs have high comorbidity with ADHD, we will not exclude trials with participants suffering CDPs comorbid with ADHD. Although results will reflect the real situation and contribute to more generalizable inferences, the risk of bias for outcomes will be raised. Second, when interpreting the results of NMA, we have to consider the heterogeneity of some variables (e.g. duration of the treatment), which are not always the same across psychosocial treatments.

Contributors LZ designed this study and drafted the protocol. ZR, XM, DR, GJ critically revised the protocol. LZ will screen search results for inclusion, conduct data extraction and data analysis and draft the final manuscript. XM, CZ will assist with data extraction and analysis and revise the final manuscript. ZZ and QL will screen search results for inclusion and conduct data extraction. All authors contributed to and have approved the final manuscript.

Competing interests The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as potential competing interests.

Funding This research was supported by the National Social Science Foundation of China (16CSH051).

Patient consent Not required.

Provenance and peer review Not commissioned; externally peer-reviewed.

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Table S1 Descriptions and examples of common psychosocial treatment types and control conditions

Treatments	Abbreviation	Description	Example (review or meta-analysis or trails)
Art Therapy	AT	AT uses art medium, including drawing, painting, clay to enable psychological change and personal growth of children and adolescents.	Moula[1]
Behavioral Therapy	BT	BT trains participants (children and adolescents, parents, teachers, etc.) using behavior management techniques such as differential reinforcement.	Axberg and Broberg[2]
Cognitive Behavioral Therapy	CBT	CBT combines BT with CT. CBT techniques commonly involve social skill training, cognitive restructuring, problem-solving, anger management.	Chen et al.[3]
Family Therapy	FT	FT works with youths and their families, in order to address family dysfunction by changing maladaptive patterns of interaction between family members, like parent-child interaction therapy.	van der Pol et al.[4]
Mindfulness	MBT	MBT trains youths' attentional awareness, strengthens the capacity of emotional and behavioral regulation and generates a shift in one's view of self.	Simpson et al.[5]
Multisystemic Therapy	MST	MST targets to address problems regarding environmental systems.	Tan and Fajardo[6]
Narrative Therapy	NAT	NAT uses narrative techniques like storytelling to cope with children and adolescents' aggression and anger.	Hosseini et al.[7]
Play Therapy	PT	PT copes with aggressive behavior, hostility, anger, etc. in recreational activities.	Bagherizadeh et al.[8]
Psychodynamic Therapy	DYN	DYN emphasizes youths' unconscious feelings and the effect of unconscious feelings on their behavior and emotions.	Weitkamp et al.[9]
Psychoeducation	PE	PE provides education or information to participants.	van der Put[10]
Control Conditions			
Treatment as Usual	TAU	TAU represents an usual treatment. It may involve in some components of psychosocial treatment and have some treatment effects, but is not a structured or formal psychosocial treatment.	-

Table S1 Descriptions and examples of common psychosocial treatment types and control conditions

Treatments	Abbreviation	Description	Example (review or meta-analysis or trails)
Waitlist	WL	WL means that participants in this control group receive any psychosocial treatments during the study, but are told they will receive one when the study finishes.	-
No treatment	NT	NT stands for that neither during the study nor the study finishes, participants in this control group will not receive any psychosocial treatments.	-

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Reported on Page
Administrative information			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	1
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	3
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	1, 16
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	
Support:			

Sources	5a	Indicate sources of financial or other support for the review	16
Sponsor	5b	Provide name for the review funder and/or sponsor	16
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	16
Introduction			
Rationale	6	Describe the rationale for the review in the context of what is already known	3-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	6
Methods			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	6-10
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	10-11
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	10-11
Study records:			

Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	11-12
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	11-13
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	11-12
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	12-13
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	9-10
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	12-13
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	13-16
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's τ)	13-16
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	14-15

	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	13-16
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	15
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	15

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

BMJ Open

Comparative efficacy and acceptability of psychosocial treatments for disruptive behaviour disorders in children and adolescents: study protocol for a systematic review and network meta-analysis

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-046091.R1
Article Type:	Protocol
Date Submitted by the Author:	27-Feb-2021
Complete List of Authors:	Zhang, Lin; Central China Normal University, School of Psychology Ren, Zhihong; Central China Normal University, School of Psychology Ma, Xueyao; University of Ulm, Department of Psychosomatic and Psychotherapy Hazer-Rau, Dilana; University of Ulm, Department of Psychosomatic and Psychotherapy Jiang, Guangrong; Central China Normal University, School of Psychology Zhao, Chunxiao; Central China Normal University, School of Psychology Zhao, Ziyi; Central China Normal University, School of Psychology Liu, Qianzi; Central China Normal University, School of Psychology
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Mental health
Keywords:	Child & adolescent psychiatry < PSYCHIATRY, MENTAL HEALTH, Impulse control disorders < PSYCHIATRY

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Comparative efficacy and acceptability of psychosocial treatments for disruptive behaviour disorders in children and adolescents: study protocol for a systematic review and network meta-analysis

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Word count: 3959

Keywords: disruptive behaviour disorders, psychosocial treatment, children and adolescents, network meta-analysis, protocol

ABSTRACT

Introduction Disruptive behaviour disorders are common among children and adolescents, with negative impacts on the youths, their families, and society. Although multiple psychosocial treatments are effective in decreasing the symptoms of disruptive behaviour disorders, comprehensive evidence regarding the comparative efficacy and acceptability between these treatments is still lacking. Therefore, we propose a systematic review and network meta-analysis, integrating both direct and indirect comparisons to obtain a hierarchy of treatment efficacy and acceptability.

Methods and analysis The present protocol will be reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols. Ten databases, including Web of Science, PubMed, PsycINFO, MEDLINE, APA PsycArticles, Psychology and Behavioral Sciences Collection, OpenDissertations, The Cochrane Library, Embase, and CINAHL, will be searched from inception for randomized controlled trials of psychosocial treatments for children and adolescents with disruptive behaviour disorders, without restrictions on language, publication year and status. The primary outcomes will be efficacy at post-treatment (severity of disruptive behaviour disorders at post-treatment) and acceptability (dropout rate for any reason) of psychosocial treatments. The secondary outcomes will involve efficacy at follow-up, severity of internalizing problems, and improvement of social functioning. Two authors will independently conduct the study selection and data extraction, assess the risk of bias using the revised Cochrane Collaboration's Risk of Bias tool, and evaluate the quality of the evidence using the Grading of Recommendations Assessment, Development and Evaluation framework to network meta-analysis. We will perform Bayesian network meta-analyses with random-effects model. Subgroup and sensitivity analyses will be performed to evaluate the robustness of the findings.

Ethics and dissemination The research does not require ethical approval. Results are planned to be published in journals or presented at conferences. The network meta-analysis will provide information on a hierarchy of treatment efficacy and

acceptability and help make a clinical treatment choice.

PROSPERO registration number CRD42020197448

Strengths and limitations of this study

Bayesian network meta-analysis can synthesize all direct and indirect evidence and allows the comparison of multiple treatments simultaneously within a single analysis.

We investigate psychosocial treatment types rather than delivery conditions for treating disruptive behaviour disorders, which contributes to complement the guidelines of National Institute for Health and Care Excellence.

Bayesian network meta-analysis will provide a hierarchy of effectiveness and acceptability of all psychosocial types for treatments of disruptive behaviour disorders, which can help clinical practitioners make optimal and evidence-based decisions.

We will not exclude trials with participants suffering disruptive behaviour disorders comorbid with attention deficit and hyperactivity disorder, which may raise the risk of bias for outcomes.

The generalizability may be impacted by the differences between treatments within categories/nodes.

BACKGROUND

Disruptive behavior disorders (DBDs), which include conduct disorder (CD) and oppositional defiant disorder (ODD),[1] are common mental and behavioral problems among children and adolescents (more common in boys than in girls), affecting more than 50 million children and adolescents worldwide according to the survey by Global Burden of Disease Study 2013 Collaborators.[2] According to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), CD is characterized by repetitive and persistent patterns of antisocial, aggressive, or rule-breaking behavior.

ODD is characterized by irritable mood, argumentative behaviour or vindictiveness.[3] Patients with DBDs have a high rate of comorbidity with other mental health problems such as attention deficit hyperactivity disorder (ADHD).[4] DBDs is costly, and can persist over time and bring about many serious consequences to the individual, school, family, and society, including poor physical health, poor school performance, social disadvantage, family conflicts, and criminal behaviors.[5] Besides, untreated CD not only can influence the functioning and quality of life of children and adolescents during their childhood and adolescence but also may develop into antisocial personality in their adulthood.[6] On the contrary, an effective treatment could increase adaptive behaviors, improve social functioning and further save 128 disability-adjusted life years (DALY) per 100,000 boys and 90 DALY per 100,000 girls in the United States.[7] Given the adverse influence of DBDs and the benefits of effective treatment, researchers and practitioners have devoted their efforts to providing professional treatments effectively and timely to children and adolescents with DBDs.

Several disciplines, such as developmental psychopathology, child psychiatry, and social psychology, have contributed to understanding the course, causes, and development of DBDs, and have yielded different perspectives for treating DBDs. Among the evidence-based interventions, psychosocial treatment is an important approach for treating DBDs, taking priority over the pharmacological treatment. Although some medications (e.g. risperidone) may have beneficial effects for DBDs, they have side effects and are not suggested for routine management.[4] Evidence from previous meta-analyses indicated that psychosocial treatment can significantly improve DBDs,[1 8 9] thence, this study focuses on psychosocial treatment for youth with DBDs. To date, there are many types of psychosocial treatments available for treating DBDs, such as behavior therapy (BT),[10] cognitive-behavioral therapy (CBT),[11] psychodynamic therapy (DYN),[12] and play therapy (PT).[13] These psychosocial treatments can be delivered with diverse conditions, including parent training programs, foster carer/guardian training programs, child-focused programs,

multimodal interventions.[4] Regarding the suitable delivery conditions for different age groups, National Institute for Health and Care Excellence (NICE) has recommended (1) parent and foster carer or guardian training programs or (2) child-focused programs or (3) parent and child training programs, for children and adolescents with DBDs aged 3-14. Meanwhile, for children and adolescents aged 11-17 NICE has recommended multimodal interventions. Previous research has not checked the comparative effectiveness of all the psychosocial treatment types yet, therefore, the current research will focus mainly on treatment types rather than delivery conditions unless there are enough numbers of included trials to distinguish between them. Another concern for psychotherapists, psychological counselors, and social workers is the acceptability of these psychosocial treatments. Some treatments are not easily accepted by participants due to high demands, long durations, stigmatization, etc., even though they can significantly reduce symptoms of DBDs.[14] Besides, due to methodological restrictions of conventional meta-analyses, it is still unclear which are the most efficacious and the most acceptable psychosocial treatments for DBDs. Fully investigating the comparative effectiveness and acceptability of all psychosocial treatments is beneficial for clinical practitioners to make an optimal and evidence-based decision on the treatment of DBDs.

Network meta-analysis (NMA), which can consider both direct (head-to-head comparison) and indirect (comparison of treatments via a common comparator) evidence, is an appropriate method to answer the questions above.[15] The standard pairwise meta-analysis cannot be used to assess relative effects across treatments if the comparisons have not been evaluated in head-to-head trials. Instead, NMA allows comparison of multiple treatments simultaneously within a single analysis as long as every treatment is connected to at least one of the other treatments under evaluation through direct comparisons.[16] Some researchers have compared the efficacy of psychotherapies or psychosocial therapies for the treatment of mental illnesses in children and adolescents, including depression,[17] acute anxiety disorders[18] and post-traumatic stress disorders (PTSD)[19]. One NMA has investigated the comparative

effects of psychosocial and pharmacologic interventions for disruptive behavior in children and adolescents.[20] However, the previous NMA grouped the same delivery conditions of psychosocial interventions (i.e. child component, parent component, and multi-component) into a node. With an increasing body of research investigating the effectiveness of treatment for DBDs, it is possible to group the same types of psychosocial treatments into a node and conduct NMA. Besides, the previous research has not explicitly made a distinction between prevention and treatment, though their backgrounds, places, and intervention methods are different.[21] Therefore, the present protocol aims to address the above limitations and synthesize all direct and indirect evidence for identifying the optimal psychosocial treatment for children and adolescents with DBDs.

OBJECTIVES

The purpose of this study is to evaluate and compare the effectiveness and acceptability of psychosocial treatments for DBDs. Specifically, we aim to

1. assess the relative psychosocial treatment effects at post-treatment for DBDs, in comparison to one another.

2. determine the acceptability of these psychosocial treatments.

3. assess the relative psychosocial treatment effects at follow-up for DBDs, in comparison to one another.

4. compare the effectiveness of psychosocial treatments on the improvement of internalizing problem outcomes at post-treatment in children and adolescents with DBDs.

5. compare the effectiveness of psychosocial treatments on the improvement of social functioning outcomes at post-treatment in children and adolescents with DBDs.

METHODS AND ANALYSIS

The systematic review and NMA is registered in the PROSPERO database (registration number: CRD42020197448) and has been developed according to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) checklist, the extension statement for NMA (PRISMA-NMA), and proposed additional considerations for protocols of systematic reviews including NMA[22-24]. The planned start and end dates are June 07, 2020 and August 31, 2021, respectively.

Eligibility criteria for study design, participants, treatments and outcomes

Designs of studies

All randomized controlled trials (RCTs), including cluster RCTs and first phase of cross-over studies, will be included. Quasi-randomized trials (e.g. randomization by the last number of the date of birth, or day of the week) will be excluded. Moreover, according to many previous NMA, if the sample size is less than ten per arm, the trials will be excluded for ensuring the power. Because the psychosocial treatments are difficult to be conducted in a double-blind design, we will include single-blind RCTs (i.e. raters were blinded) or trials in which participants were assessed by self-rating scales. Considering the validity of young children's reports, we will exclude trials in which outcomes were only reported by children younger than 11 years old. Language, year of publication, publication status will not be restricted.

Types of participants

Children and adolescents with DBDs, who were no more than 18 years old when they enrolled in trials, will be included. We will identify DBDs by either a formal diagnosis of DBDs on the basis of the Diagnostic and Statistical Manual (DSM) or the International Classification of Diseases (ICD), or a standardized rating scale on DBDs. The common scales measuring DBDs and their clinical cut-off values are shown in

Table 1. Trials in which participants have a secondary diagnosis of comorbid psychiatric disorders (autism spectrum disorder, depressive disorder, anxiety disorder, etc.), or intellectual, or neurological, or physical disability will be excluded. We will also exclude trials in which participants are at risk of other mental disorders (learning disorder, substance-related disorders, etc). It is noteworthy that trials in which participants have comorbidity with ADHD or emotional problems (i.e., do not meet diagnostic criteria for mood disorders, anxiety disorder, etc.) will be included. All treatment settings (i.e. outpatient, inpatient services, community clinics, and schools) will be included.

Table 1 Hierarchy of DBDs severity scales and their clinical cut-off values

Hierarchy	Scales	Abbreviation	Clinical Range
1	Eyberg Child Behavior Inventory	ECBI	Norway version: > 90th percentile US version: > 15 for the Problem score scale or/and > 132 for the Intensity score scale (> 93th percentile), problem score > 15
2	Achenbach System of Empirically Based Assessment	ASEBA	> 98th percentile (T score > 70) for oppositional defiant problems or conduct problems in DSM-oriented scales
3	Strengths and Difficulties Questionnaire	SDQ	conduct problems subscale score > 5
4	Revised Behavior Problem Checklist	RBPC	T score > 70 for conduct disorder subscale

Types of treatments

According to NICE guidelines, psychosocial interventions for DBDs can be delivered through parent training programs, parent and child training programs for children with complex needs, foster carer/guardian training programs, child-focused programs, and multimodal interventions.[4] Psychosocial interventions are categorized according to

the delivery conditions but not treatment types. Table S1 shows descriptions and examples of common psychosocial treatment types and control conditions on the topic. The effects of many types of psychosocial treatments on DBDs have been explored in several reviews, traditional meta-analyses, or RCTs. Because CBT is the most common treatment type for DBDs, CBT with different treatment focuses (social skills training, anger coping/management training, or problem-solving skills-training) different delivery conditions (child-focused, parent-focused, or both parent and child involved), delivery mediums (Internet-based or face-to-face) and delivery formats (group, individual or group plus individual) will be separated as independent nodes if data are available. For the other treatment types, trials comparing the same treatment types will be grouped into the same node no matter which delivery conditions, delivery mediums, and delivery formats they used. Control groups include no treatment, waitlist, and treatment as usual.

Types of outcome measures

Primary outcomes

1. Efficacy at post-treatment, measured using the change score between baseline and end-point (at post-treatment) from scales assessing the severity of DBDs.[25] Where multiple scales are reported, we will extract data from the DBDs severity scales in a hierarchical fashion (table 1). Besides, when multiple raters report a DBDs severity scale, we will calculate the composite score according to NICE-guidelines[4].

2. Acceptability of psychosocial treatment, defined as the dropout rate for any reason during psychological treatments.

Secondary outcomes

Besides the primary outcomes, we will also assess relative psychosocial treatment effects at follow-up for DBDs because we want to know whether the short-term

effects of the psychosocial types are different from the long-term effects. Moreover, we will also compare the effectiveness of psychosocial treatments on the improvement of internalizing problems and social functioning. We focus on these questions because DBDs are always complied with internalizing problems and impairment of social functioning. It would be valuable to examine whether treatments that are effective in decreasing DBDs symptoms are equally effective in improving internalizing problems and social functioning.

1. Efficacy at follow up, measured by the change score of DBDs severity scales between baseline and 6-month follow up/ nearest 6-month follow-up.

2. Internalizing problems, measured by the change score between baseline and end-point (at post-treatment) from internalizing problem scales, such as Achenbach System of Empirically Based Assessment (i.e. Child Behavior Checklist, Teacher's Report Form and Youth Self-Report), Revised Behavior Problem Checklist, Child and Adolescent Functional Assessment Scale, Revised Children's Manifest Anxiety Scale, State Trait Anxiety Inventory for Children, Beck Depression Inventory, Children's Depression Rating Scale Revised, Hamilton Depression Rating Scale. If the above scales are not available, other valid scales on internalizing problems will be used.

3. Social functioning, measured by the change score between baseline and end-point (at post-treatment) from social functioning scales, such as Children's Global Assessment Scale, Social Competence Inventory, Matson Evaluation of Social Skills with Youngsters, School Social Behavior Scales, Social Skills Improvement System Rating Scales. If the above scales are not available, other valid scales on social functioning will be used.

Search strategy

Ten electronic databases, including Web of Science, PubMed, PsycINFO, MEDLINE,

APA PsycArticles, Psychology and Behavioral Sciences Collection, Open Dissertations, The Cochrane Library, Embase, and CINAHL will be searched without restriction on language, publication status, or publication period. We take Web of Science as an example, the following search terms are applied:

TS=("conduct problem*" OR "conduct disorder*" OR "oppositional behavior*" OR "oppositional behaviour*" OR "oppositional defiant disorder*" OR "externalizing behavior*" OR "externalizing behaviour*" OR "externalizing disorder*" OR "disruptive behavior disorder*" OR "disruptive behaviour disorder*" OR "disruptive behavior*" OR "disruptive behaviour*" OR agressi* OR antisocial* OR callous-unemotion* OR delinquen* OR devian* OR hostile OR hostility OR bully* OR bullie*)

AND TS=(youth* OR child* OR adolescent* OR juvenile* OR boy* OR girl* OR parent* OR teenage*)

AND TS=(intervention OR therapy OR treatment OR evaluation OR "randomized controlled trial" OR "controlled clinical trial" OR effectiveness OR efficacy OR "controlled trial" OR randomized OR trial)

NOT TS=(animal*)

In order not to omit any relevant research, we will search eligible studies of reviews and meta-analyses on related topics, and further search reference lists of all eligible studies manually. Moreover, we will contact the corresponding author to complement incomplete data.

Selection of studies and data extraction

All results generated from systematic searches will be imported in Noteexpress and duplicates will be excluded. Two independent authors will identify initially 10% of studies from the titles and abstracts according to the predefined eligibility criteria for

ensuring consistency. If a high level of inconsistency occurs, the eligibility criteria of the studies will be clarified through a discussion with a senior researcher. If there is a high degree of consistency, all potentially eligible articles will be identified from titles and abstracts by the two authors independently and disagreements will be resolved by a senior researcher. Then, all full-text potentially eligible articles will be obtained and screened by the two independent authors according to the same criteria and disagreements will be resolved as aforementioned. Additional information will be obtained from study authors if required. Reasons for exclusion for each trial will be reported at the stage of full-text screening. Finally, the process of study selection will be shown by using a PRISMA flow chart.

Data extraction

The following data will be extracted by two authors independently from all selected trials and disagreements will be resolved by a senior researcher if required.

Study characteristics include study title, study authors, publication year, publication type, publication journal, country and source of funding, study design, randomization, and blinding.

Participant characteristics include age, gender, race/ethnicity (if it was reported in the study), socioeconomic status (if it was reported in the study), sample size, diagnostic criteria for DBDs, age of onset of DBDs symptoms, comorbidities, baseline severity, maternal mental health, parent-child relationship, parenting skills, parent readiness for treatment and the total number of participants.

Intervention characteristics include the type of psychosocial therapy, delivery condition (child-focused, parent-focused, or both parent and child involved), delivery medium (Internet-based or face-to-face), delivery format (group, individual or group plus individual), treatment setting, duration of a session, number of sessions, frequency of treatment, length of treatment, fidelity (ie., the average implementing

sessions divided by the total sessions of the program), people who delivered the treatment, follow-up duration, and co-interventions.

Outcome measures include scores of mean and standard deviation, number of participants, and people who rated the outcome (i.e. children, parents, teachers, clinicians, or researchers) for each predefined outcome.

Adherence measures include the total number of subjects at pre- and post-treatment and at follow-up measurements, and reasons for attrition to treatment.

Data at the closest time point to six-month follow-up will be extracted if data for multiple follow-up time points were provided in the studies. We will contact the corresponding authors by sending emails if any information that we want to extract was not provided in their studies.

Risk of bias assessment

The risk of bias assessment will be assessed by two authors independently according to the revised Cochrane Collaboration's risk of bias tool (RoB 2.0) for RCTs.[26] Any disagreement will be resolved by a senior researcher if required. The overall risk of bias will be rated as 'low risk' (i.e. low risk of bias in all domains), 'high risk' (i.e. high risk of bias in at least one domain, or having some concerns in multiple domains), or 'some concerns' (i.e. having some concerns in at least one domain and no high risk of bias in any domain). Specifically, we will answer the signaling questions following available algorithms and judge the risk of bias as low, high, or some concerns for each domain: (1) bias deriving from the randomization process (e.g. sequence generation and allocation concealment), (2) bias arising from the blinding (e.g. blinding of participants and blinding of outcome assessors), (3) bias caused by incomplete outcome data, (4) bias due to the measurement of outcome and (5) bias due to the selective reporting. The result of the assessment of the risk of bias will be presented in a risk of bias summary graph.

Data analysis

Bayesian NMA with random-effects model will be performed by using WinBUGS V.1.4.3 to synthesize all evidence for each outcome. Compared with frequentist approach, Bayesian framework can benefit decision making, which can help create stable estimates and their credible intervals, which is further advantageous for making probabilistic statements and predictions on the treatment effects more straightforward.[27] Besides the Bayesian NMA, conventional pairwise meta-analyses with random-effects model will be employed for the comparison between active treatments and control arms by using Stata V.16. as a reference for the results of NMAs.

For continuous outcomes, standardized mean difference (SMD) will be used as a measurement of effect size. We will use published mean values and standard deviations (SDs), if not available, we will estimate values by conversion from standard errors (SEs), *p* values, confidence intervals (CIs), or t-values. We will contact the authors of the study to obtain information if none of the above values is provided in the published paper. If we cannot obtain the information using this approach, missing SDs will be derived from those of the other studies using a validated imputation technique.[28] For the dichotomous outcome, the risk ratio (RR) and its 95% CIs will be calculated as effect sizes. Missing data will be managed with respect to the intention to treat (ITT) principle. Participants who drop out after randomization are regarded as non-responders.

In order to assess the transitivity assumption of NMA, we will assess the distribution of clinical and methodological variables.[29] Concerning clinical variables, we have assured the transitivity by limiting our samples to participants with DBDs and excluding participants with comorbid psychiatric disorders (autism spectrum disorder, depressive disorder, anxiety disorder, etc.), or intellectual, or neurological, or physical disability. Other clinical or methodological variables that may influence the efficacy of psychosocial treatments include age, number of sessions, length of treatment.

Heterogeneity will be assessed using the I^2 statistic and its 95% confidence interval (CI). For visualization, the overlap of the CIs will be shown with forest plots. For the NMA, we assume a common heterogeneity variance across the various treatment comparisons and assess it with τ^2. Possible reasons for heterogeneity will be examined by subgroup analysis.

Furthermore, we will assess the global inconsistency as well as local inconsistency. Global consistency will be evaluated by calculating the design-by-treatment interaction test. The local inconsistency will be evaluated by comparing the disagreement between direct and indirect evidence in evidence loops. The results of the inconsistency test will be interpreted with caution because the test is known to have low power.[30]

Finally, the surface under the cumulative ranking curve (SUCRA) and mean ranks will be used to summarize the probabilities of treatments and provide a hierarchy of competing treatments.

Subgroup analyses, meta-regression, and sensitivity analyses

If there are sufficient data in each subgroup, we will conduct a subgroup analysis to examine how treatment efficacy varies across different subgroups: (1) study setting (clinic, school or community), (2) age group (3-10 years, 11-14 years or 15-17 years), The age group is divided according to NICE-guidelines, in which parenting training programmes were recommended for 3-11 years, cognitive behavioural approaches were recommended for 9-14 years, and multimodal programmes were recommended for 11-17 years. (3) socioeconomic status, (4) outcome rater (composite, mother, father, teacher, child or observer) (5) age of onset of DBDs symptoms (3-10 years or 11-17 years) (6) diagnosis (formal diagnosis of ODD, formal diagnosis of CD or scale-assessed DBDs) and (7) country. Besides, we will conduct network meta-regression meta-analyses of data on the outcome of efficacy at post-treatment to evaluate the influence of the following potential moderators: (1) number of sessions,

and (2) length of treatment, (3) fidelity (ie., the average implementing sessions divided by the total sessions of the program), (4) baseline severity (SDQ, ASEBA, ECBI or RBPC score at baseline) (5) maternal mental health, (6) parent-child relationship, (7) parenting skills, and (8) parent readiness for treatment. Moreover, we will explore the sensitivity analyses by excluding: (1) studies in which missing data have been imputed, (2) studies in which high risk of bias rating have been assessed, and (3) studies in which participants comorbidity with ADHD have been included.

Publication bias

First, if ten or more studies are included in the NMA, funnel plots of pairwise NMAs will be examined. Moreover, comparison-adjusted funnel plots will be used to examine the association between study size and effect size. Furthermore, Egger's test will be used to examine the significance of publication bias.

Quality of the evidence

Grading of Recommendations Assessment, Development, and Evaluation framework specifically developed for NMA will be applied to evaluate the quality of evidence.[31] Specifically, we will characterize the credibility of a body of evidence on the basis of within-study bias, reporting bias, indirectness, imprecision, heterogeneity, and incoherence by using the CINeMA software.[32] The starting point for confidence in each network estimate is high but will be downgraded according to the assessments of the above six domains.

Ethics and dissemination

The NMA does not need ethical approval as no primary data are collected, and none human nor animal participants will be involved directly. Findings of the present research are planned to be published at national or international psychological conferences, or in a reputable scientific journal.

Patient and public involvement

No patient involved.

DISCUSSION AND SUMMARY

The systematic review and NMA will provide an overview and information on the comparative efficacy and acceptability of psychosocial treatments for children and adolescents with DBDs. The results will show a hierarchy of comparative efficacy with regard to symptoms of DBDs at post-treatment and follow-up, as well as in terms of acceptability, improvement of internalizing problems, and improvement of social functioning. Moreover, the results of subgroup analysis and meta-regression can help personalize the information to the youth, setting or other factors. To the best of our knowledge, this study will be the first NMA focusing on the treatment types rather than the delivery conditions in investigating the hierarchy of effectiveness and acceptability of psychosocial treatments for DBDs. The findings are expected to assist psychological counselors, psychotherapists, and social workers to make a better and evidence-based treatment choice.

It is worth noting that the findings need to be understood in light of study limitations. First, because of the fact that DBDs have high comorbidity with ADHD, we will not exclude trials with participants suffering DBDs comorbid with ADHD. Although results will reflect the real situation and contribute to more generalizable inferences, the risk of bias for outcomes will be raised. Second, when interpreting the results of NMA, we have to consider the heterogeneity of some variables (e.g. duration of the treatment), which are not always the same across psychosocial treatments. Last, it is an excessive challenge to determine how to separate psychosocial treatments as independent nodes because some psychosocial treatments are multicomponent and vary in module, content, etc. In further research, we could conduct component NMA for a specific psychosocial treatment (eg CBT) to further investigate whether some components are superior to others in the DBDs treatment.

Contributors LZ designed this study and drafted the protocol. ZR, XM, DR, GJ critically revised the protocol. LZ will screen search results for inclusion, conduct data extraction and data analysis and draft the final manuscript. XM, CZ will assist with data extraction and analysis and revise the final manuscript. ZZ and QL will screen search results for inclusion and conduct data extraction. All authors contributed to and have approved the final manuscript.

Competing interests The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as potential competing interests.

Funding This research was supported by the National Social Science Foundation of China (16CSH051).

Patient consent Not required.

Provenance and peer review Not commissioned; externally peer-reviewed.

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Table S1 Descriptions and examples of common psychosocial treatment types and control conditions

Treatments	Abbreviation	Description	Example (review or meta-analysis or trails)
Art Therapy	AT	AT uses art medium, including drawing, painting, clay to enable psychological change and personal growth of children and adolescents.	Moula[1]
Behavioral Therapy	BT	BT trains participants (children and adolescents, parents, teachers, etc.) using behavior management techniques such as differential reinforcement.	Axberg and Broberg[2]
Cognitive Behavioral Therapy	CBT	CBT combines BT with CT. CBT techniques commonly involve social skill training, cognitive restructuring, problem-solving, anger management.	Chen et al.[3]
Family Therapy	FT	FT works with youths and their families, in order to address family dysfunction by changing maladaptive patterns of interaction between family members, like parent-child interaction therapy.	van der Pol et al.[4]
Mindfulness	MBT	MBT trains youths' attentional awareness, strengthens the capacity of emotional and behavioral regulation and generates a shift in one's view of self.	Simpson et al.[5]
Multisystemic Therapy	MST	MST targets to address problems regarding environmental systems.	Tan and Fajardo[6]
Narrative Therapy	NAT	NAT uses narrative techniques like storytelling to cope with children and adolescents' aggression and anger.	Hosseini et al.[7]
Play Therapy	PT	PT copes with aggressive behavior, hostility, anger, etc. in recreational activities.	Bagherizadeh et al.[8]
Psychodynamic Therapy	DYN	DYN emphasizes youths' unconscious feelings and the effect of unconscious feelings on their behavior and emotions.	Weitkamp et al.[9]
Psychoeducation	PE	PE provides education or information to participants.	van der Put[10]
Control Conditions			
Treatment as Usual	TAU	TAU represents an usual treatment. It may involve in some components of psychosocial treatment and have some treatment effects, but is not a structured or formal psychosocial treatment.	-

Table S1 Descriptions and examples of common psychosocial treatment types and control conditions

Treatments	Abbreviation	Description	Example (review or meta-analysis or trails)
Waitlist	WL	WL means that participants in this control group receive any psychosocial treatments during the study, but are told they will receive one when the study finishes.	-
No treatment	NT	NT stands for that neither during the study nor the study finishes, participants in this control group will not receive any psychosocial treatments.	-

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Reported on Page
Administrative information			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	1
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	3
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	1, 16
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	
Support:			

Sources	5a	Indicate sources of financial or other support for the review	16
Sponsor	5b	Provide name for the review funder and/or sponsor	16
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	16
Introduction			
Rationale	6	Describe the rationale for the review in the context of what is already known	3-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	6
Methods			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	6-10
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	10-11
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	10-11
Study records:			

Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	11-12
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	11-13
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	11-12
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	12-13
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	9-10
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	12-13
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	13-16
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's τ)	13-16
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	14-15

	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	13-16
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	15
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	15

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

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BMJ Open

Comparative efficacy and acceptability of psychosocial treatments for disruptive behaviour disorders in children and adolescents: study protocol for a systematic review and network meta-analysis

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2020-046091.R2
Article Type:	Protocol
Date Submitted by the Author:	04-Jun-2021
Complete List of Authors:	Zhang, Lin; Central China Normal University, School of Psychology Ren, Zhihong; Central China Normal University, School of Psychology Ma, Xueyao; University of Ulm, Department of Psychosomatic and Psychotherapy Hazer-Rau, Dilana; University of Ulm, Department of Psychosomatic and Psychotherapy Jiang, Guangrong; Central China Normal University, School of Psychology Zhao, Chunxiao; Central China Normal University, School of Psychology Zhao, Ziyi; Central China Normal University, School of Psychology Liu, Qianzi; Central China Normal University, School of Psychology Yuan, Fenghui; Central China Normal University, School of Psychology
Primary Subject Heading:	Mental health
Secondary Subject Heading:	Mental health
Keywords:	Child & adolescent psychiatry < PSYCHIATRY, MENTAL HEALTH, Impulse control disorders < PSYCHIATRY

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Comparative efficacy and acceptability of psychosocial treatments for disruptive behaviour disorders in children and adolescents: study protocol for a systematic review and network meta-analysis

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Word count: 3959

Keywords: disruptive behaviour disorders, psychosocial treatment, children and adolescents, network meta-analysis, protocol

ABSTRACT

Introduction Disruptive behaviour disorders are common among children and adolescents, with negative impacts on the youths, their families, and society. Although multiple psychosocial treatments are effective in decreasing the symptoms of disruptive behaviour disorders, comprehensive evidence regarding the comparative efficacy and acceptability between these treatments is still lacking. Therefore, we propose a systematic review and network meta-analysis, integrating both direct and indirect comparisons to obtain a hierarchy of treatment efficacy and acceptability.

Methods and analysis The present protocol will be reported according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols. Ten databases, including Web of Science, PubMed, PsycINFO, MEDLINE, APA PsycArticles, Psychology and Behavioral Sciences Collection, OpenDissertations, The Cochrane Library, Embase, and CINAHL, will be searched from inception for randomized controlled trials of psychosocial treatments for children and adolescents with disruptive behaviour disorders, without restrictions on language, publication year and status. The primary outcomes will be efficacy at post-treatment (severity of disruptive behaviour disorders at post-treatment) and acceptability (dropout rate for any reason) of psychosocial treatments. The secondary outcomes will involve efficacy at follow-up, severity of internalizing problems, and improvement of social functioning. Two authors will independently conduct the study selection and data extraction, assess the risk of bias using the revised Cochrane Collaboration's Risk of Bias tool, and evaluate the quality of the evidence using the Grading of Recommendations Assessment, Development and Evaluation framework to network meta-analysis. We will perform Bayesian network meta-analyses with a random-effects model. Subgroup and sensitivity analyses will be performed to evaluate the robustness of the findings.

Ethics and dissemination The research does not require ethical approval. Results are planned to be published in journals or presented at conferences. The network meta-analysis will provide information on a hierarchy of treatment efficacy and

acceptability and help make a clinical treatment choice.

PROSPERO registration number CRD42020197448

Strengths and limitations of this study

Bayesian network meta-analysis can synthesize all direct and indirect evidence and allows the comparison of multiple treatments simultaneously within a single analysis.

We investigate psychosocial treatment types rather than delivery conditions for treating disruptive behaviour disorders, which contributes to complement the guidelines of National Institute for Health and Care Excellence.

Bayesian network meta-analysis will provide a hierarchy of effectiveness and acceptability of all psychosocial treatment types for disruptive behaviour disorders, which can help clinical practitioners make optimal and evidence-based decisions.

We will not exclude trials with participants suffering disruptive behaviour disorders comorbid with attention deficit and hyperactivity disorder, which may raise the risk of bias for outcomes.

The generalizability may be impacted by the differences between treatments within categories/nodes.

BACKGROUND

Disruptive behaviour disorders (DBDs), which include conduct disorder (CD) and oppositional defiant disorder (ODD),[1] are common mental and behavioral problems among children and adolescents (more common in boys than in girls), affecting more than 50 million children and adolescents worldwide according to the survey by Global Burden of Disease Study 2013 Collaborators.[2] According to the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), CD is characterized by repetitive and persistent patterns of antisocial, aggressive, or rule-breaking behaviour.

ODD is characterized by irritable mood, argumentative behaviour, or vindictiveness.[3] Patients with DBDs have a high rate of comorbidity with other mental health problems such as attention deficit hyperactivity disorder (ADHD).[4] DBDs are costly and can persist over time and bring about many serious consequences to the individual, school, family, and society, including poor physical health, poor school performance, social disadvantage, family conflicts, and criminal behaviors.[5] Besides, untreated CD not only can influence the functioning and quality of life of children and adolescents during their childhood and adolescence but also may develop into antisocial personality in their adulthood.[6] On the contrary, an effective treatment could increase adaptive behaviours, improve social functioning and further save 128 disability-adjusted life years (DALY) per 100,000 boys and 90 DALY per 100,000 girls in the United States.[7] Given the adverse influence of DBDs and the benefits of effective treatment, researchers and practitioners have devoted their efforts to providing professional treatments effectively and timely to children and adolescents with DBDs.

Several disciplines, such as developmental psychopathology, child psychiatry, and social psychology, have contributed to understanding the course, causes, and development of DBDs, and have yielded different perspectives for treating DBDs. Among the evidence-based interventions, psychosocial treatment is an important approach for treating DBDs, taking priority over pharmacological treatment. Although some medications (e.g. risperidone) may have beneficial effects for DBDs, they have side effects and are not suggested for routine management.[4] Evidence from previous meta-analyses indicates that psychosocial treatment can significantly improve DBDs,[1 8 9] thence, this study will focus on psychosocial treatment for youth with DBDs. To date, there are many types of psychosocial treatments available for treating DBDs, such as behavior therapy (BT),[10] cognitive-behavioural therapy (CBT),[11] psychodynamic therapy (DYN),[12] and play therapy (PT).[13] These psychosocial treatments can be delivered with diverse conditions, including parent training programmes, foster carer/guardian training programmes, child-focused

programmes, multimodal interventions.[4] National Institute for Health and Care Excellence (NICE) has suggested suitable delivery conditions for different age groups. NICE has recommended (1) parent and foster carer or guardian training programmes or (2) child-focused programmes or (3) parent and child training programmes, for children and adolescents with DBDs aged 3-14. Meanwhile, for children and adolescents aged 11-17 NICE has recommended multimodal interventions. Previous research has not checked the comparative effectiveness of all the psychosocial treatment types yet, therefore, the current research will focus mainly on treatment types rather than delivery conditions unless there are enough numbers of included trials to distinguish between them. Another concern for psychotherapists, psychological counselors, and social workers is the acceptability of these psychosocial treatments. Some treatments are not easily accepted by participants due to high demands, long durations, stigmatization, etc., even though they can significantly reduce symptoms of DBDs.[14] Besides, due to methodological restrictions of conventional meta-analyses, it is still unclear which are the most efficacious and the most acceptable psychosocial treatments for DBDs. Fully investigating the comparative effectiveness and acceptability of all psychosocial treatments is beneficial for clinical practitioners to make an optimal and evidence-based decision on the treatment of DBDs.

Network meta-analysis (NMA), which can consider both direct (head-to-head comparison) and indirect (comparison of treatments via a common comparator) evidence, is an appropriate method to answer the questions above.[15] The standard pairwise meta-analysis cannot be used to assess relative effects across treatments if the comparisons have not been evaluated in head-to-head trials. Instead, NMA allows the comparison of multiple treatments simultaneously within a single analysis as long as every treatment is connected to at least one of the other treatments under evaluation through direct comparisons.[16] Some researchers have compared the efficacy of psychotherapies or psychosocial therapies for the treatment of mental illnesses in children and adolescents, including depression,[17] acute anxiety disorders,[18] and

post-traumatic stress disorders (PTSD).[19] One NMA has investigated the comparative effects of psychosocial and pharmacologic interventions for disruptive behavior in children and adolescents.[20] However, the previous NMA grouped the same delivery conditions of psychosocial interventions (i.e. child component, parent component, and multi-component) into a node. With an increasing body of research investigating the effectiveness of treatment for DBDs, it is possible to group the same types of psychosocial treatments into a node and conduct NMA. Besides, the previous research has not explicitly made a distinction between prevention and treatment, though their backgrounds, places, and intervention methods are different.[21] Therefore, the present protocol aims to address the above limitations and synthesize all direct and indirect evidence for identifying the optimal psychosocial treatment for children and adolescents with DBDs.

OBJECTIVES

The purpose of this study is to evaluate and compare the effectiveness and acceptability of psychosocial treatments for DBDs. Specifically, we aim to

1. assess the relative psychosocial treatment effects at post-treatment for DBDs, in comparison to one another.

2. determine the acceptability of these psychosocial treatments.

3. assess the relative psychosocial treatment effects at follow-up for DBDs, in comparison to one another.

4. compare the effectiveness of psychosocial treatments on the improvement of internalizing problem outcomes at post-treatment in children and adolescents with DBDs.

5. compare the effectiveness of psychosocial treatments on the improvement of social functioning outcomes at post-treatment in children and adolescents with

DBDs.

METHODS AND ANALYSIS

The systematic review and NMA is registered in the PROSPERO database (registration number: CRD42020197448) and has been developed according to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) checklist, the extension statement for NMA (PRISMA-NMA), and proposed additional considerations for protocols of systematic reviews including NMA.[22-24] The planned start and end dates are June 07, 2020 and August 31, 2021, respectively.

Eligibility criteria for study design, participants, treatments and outcomes

Designs of studies

All randomized controlled trials (RCTs), including cluster RCTs and first phase of cross-over studies, will be included. Quasi-randomized trials (e.g. randomization by the last number of the date of birth, or day of the week) will be excluded. Moreover, according to many previous NMA,[18 25] if the sample size is less than ten per arm, the trials will be excluded for ensuring the power. Because the psychosocial treatments are difficult to be conducted in a double-blind design, we will include single-blind RCTs (i.e. raters were blinded) or trials in which participants were assessed by self-rating scales. Considering the validity of young children's reports, we will exclude trials in which outcomes were only reported by children younger than 11 years old. Language, year of publication, and publication status will not be restricted.

Types of participants

Children and adolescents with DBDs, who were no more than 18 years old when they enrolled in trials, will be included. We will identify DBDs by either a formal diagnosis of DBDs on the basis of the Diagnostic and Statistical Manual (DSM) or the

International Classification of Diseases (ICD) or a standardized rating scale on DBDs. The common scales measuring DBDs and their clinical cut-off values are shown in Table 1. Trials in which participants have a secondary diagnosis of comorbid psychiatric disorders (autism spectrum disorder, depressive disorder, anxiety disorder, etc.), or intellectual, or neurological, or physical disability will be excluded. We will also exclude trials in which participants are at risk of other mental disorders (learning disorder, substance-related disorders, etc). It is noteworthy that trials in which participants have comorbidity with ADHD or emotional problems (i.e., do not meet diagnostic criteria for mood disorders, anxiety disorder, etc.) will be included. All treatment settings (i.e. outpatient, inpatient services, community clinics, and schools) will be included.

Table 1 Hierarchy of DBDs severity scales and their clinical cut-off values

Hierarchy	Scales	Abbreviation	Clinical Range
1	Eyberg Child Behavior Inventory	ECBI	Norway version: > 90th percentile US version: > 15 for the Problem score scale or/and > 132 for the Intensity score scale (> 93th percentile), problem score > 15
2	Achenbach System of Empirically Based Assessment	ASEBA	> 98th percentile (T score > 70) for oppositional defiant problems or conduct problems in DSM-oriented scales
3	Strengths and Difficulties Questionnaire	SDQ	conduct problems subscale score > 5
4	Revised Behavior Problem Checklist	RBPC	T score > 70 for conduct disorder subscale

Types of treatments

According to NICE guidelines, psychosocial interventions for DBDs can be delivered through parent training programmes, parent and child training programmes for

children with complex needs, foster carer/guardian training programmes, child-focused programmes, and multimodal interventions.[4] Psychosocial interventions are categorized according to the delivery conditions but not treatment types. Table S1 shows descriptions and examples of common psychosocial treatment types and control conditions on the topic. The effects of many types of psychosocial treatments on DBDs have been explored in several reviews, traditional meta-analyses, or RCTs. Because CBT is the most common treatment type for DBDs, CBT with different treatment focuses (social skills training, anger coping/management training, or problem-solving skills-training) different delivery conditions (child-focused, parent-focused, or both parent and child involved), delivery mediums (Internet-based or face-to-face) and delivery formats (group, individual or group plus individual) will be separated as independent nodes if data are available. For the other treatment types, trials comparing the same treatment types will be grouped into the same node no matter which delivery conditions, delivery mediums, and delivery formats they used. Control groups include no treatment, waitlist, and treatment as usual.

Types of outcome measures

Primary outcomes

1. Efficacy at post-treatment, measured using the change score between baseline and end-point (at post-treatment) from scales assessing the severity of DBDs.[26] Where multiple scales are reported, we will extract data from the DBDs severity scales in a hierarchical fashion (table 1). Besides, when multiple raters report a DBDs severity scale, we will calculate the composite score according to NICE-guidelines.[4]

2. Acceptability of psychosocial treatment, defined as the dropout rate for any reason during psychological treatments.

Secondary outcomes

Besides the primary outcomes, we will also assess relative psychosocial treatment effects at follow-up for DBDs because we want to know whether the short-term effects of the psychosocial types are different from the long-term effects. Moreover, we will also compare the effectiveness of psychosocial treatments on the improvement of internalizing problems and social functioning. We focus on these questions because DBDs are always complied with internalizing problems and impairment of social functioning. It would be valuable to examine whether treatments that are effective in decreasing DBDs symptoms are equally effective in improving internalizing problems and social functioning.

1. Efficacy at follow up, measured by the change score of DBDs severity scales between baseline and 6-month follow up/ nearest 6-month follow-up.

2. Internalizing problems, measured by the change score between baseline and end-point (at post-treatment) from internalizing problem scales, such as Achenbach System of Empirically Based Assessment (i.e. Child Behavior Checklist, Teacher's Report Form and Youth Self-Report), Revised Behavior Problem Checklist, Child and Adolescent Functional Assessment Scale, Revised Children's Manifest Anxiety Scale, State Trait Anxiety Inventory for Children, Beck Depression Inventory, Children's Depression Rating Scale Revised, Hamilton Depression Rating Scale. If the above scales are not available, other valid scales on internalizing problems will be used.

3. Social functioning, measured by the change score between baseline and end-point (at post-treatment) from social functioning scales, such as Children's Global Assessment Scale, Social Competence Inventory, Matson Evaluation of Social Skills with Youngsters, School Social Behavior Scales, Social Skills Improvement System Rating Scales. If the above scales are not available, other valid scales on social functioning will be used.

Search strategy

Ten electronic databases, including Web of Science, PubMed, PsycINFO, MEDLINE, APA PsycArticles, Psychology and Behavioral Sciences Collection, Open Dissertations, The Cochrane Library, Embase, and CINAHL will be searched without restriction on language, publication status, or publication period. We take Web of Science as an example, the following search terms are applied:

TS=("conduct problem*" OR "conduct disorder*" OR "oppositional behavior*" OR "oppositional behaviour*" OR "oppositional defiant disorder*" OR "externalizing behavior*" OR "externalizing behaviour*" OR "externalizing disorder*" OR "disruptive behavior disorder*" OR "disruptive behaviour disorder*" OR "disruptive behavior*" OR "disruptive behaviour*" OR agressi* OR antisocial* OR callous-unemotion* OR delinquen* OR devian* OR hostile OR hostility OR bully* OR bullie*)

AND TS=(youth* OR child* OR adolescent* OR juvenile* OR boy* OR girl* OR parent* OR teenage*)

AND TS=(intervention OR therapy OR treatment OR evaluation OR "randomized controlled trial" OR "controlled clinical trial" OR effectiveness OR efficacy OR "controlled trial" OR randomized OR trial)

NOT TS=(animal*)

In order not to omit any relevant research, we will search eligible studies of reviews and meta-analyses on related topics, and further search reference lists of all eligible studies manually. Moreover, we will contact the corresponding author to complement incomplete data.

Selection of studies and data extraction

All results generated from systematic searches will be imported in Noteexpress and duplicates will be excluded. Two independent authors will identify initially 10% of

studies from the titles and abstracts according to the predefined eligibility criteria for ensuring consistency. If a high level of inconsistency occurs, the eligibility criteria of the studies will be clarified through a discussion with a senior researcher. If there is a high degree of consistency, all potentially eligible articles will be identified from titles and abstracts by the two authors independently and disagreements will be resolved by a senior researcher. Then, all full-text potentially eligible articles will be obtained and screened by the two independent authors according to the same criteria and disagreements will be resolved as aforementioned. Additional information will be obtained from study authors if required. Reasons for exclusion for each trial will be reported at the stage of full-text screening. Finally, the process of study selection will be shown by using a PRISMA flow chart.

Data extraction

The following data will be extracted by two authors independently from all selected trials and disagreements will be resolved by a senior researcher if required.

Study characteristics include study title, study authors, publication year, publication type, publication journal, country and source of funding, study design, randomization, and blinding.

Participant characteristics include age, gender, race/ethnicity (if it was reported in the study), socioeconomic status (if it was reported in the study), sample size, diagnostic criteria for DBDs, age of onset of DBDs symptoms, comorbidities, baseline severity, maternal mental health, parent-child relationship, parenting skills, parent readiness for treatment and the total number of participants.

Intervention characteristics include the type of psychosocial therapy, delivery condition (child-focused, parent-focused, or both parent and child involved), delivery medium (Internet-based or face-to-face), delivery format (group, individual or group plus individual), treatment setting, duration of a session, number of sessions,

frequency of treatment, length of treatment, fidelity (ie., the average implementing sessions divided by the total sessions of the programmes), people who delivered the treatment, follow-up duration, and co-interventions.

Outcome measures include scores of mean and standard deviation, number of participants, and people who rated the outcome (i.e. children, parents, teachers, clinicians, or researchers) for each predefined outcome.

Adherence measures include the total number of subjects at pre- and post-treatment and at follow-up measurements, and reasons for attrition to treatment.

Data at the closest time point to six-month follow-up will be extracted if data for multiple follow-up time points were provided in the studies. We will contact the corresponding authors by sending emails if any information that we want to extract was not provided in their studies.

Risk of bias assessment

The risk of bias assessment will be assessed by two authors independently according to the revised Cochrane Collaboration's risk of bias tool (RoB 2.0) for RCTs.[27] Any disagreement will be resolved by a senior researcher if required. The overall risk of bias will be rated as 'low risk' (i.e. low risk of bias in all domains), 'high risk' (i.e. high risk of bias in at least one domain, or having some concerns in multiple domains), or 'some concerns' (i.e. having some concerns in at least one domain and no high risk of bias in any domain). Specifically, we will answer the signaling questions following available algorithms and judge the risk of bias as low, high, or some concerns for each domain: (1) bias deriving from the randomization process (e.g. sequence generation and allocation concealment), (2) bias arising from the blinding (e.g. blinding of participants and blinding of outcome assessors), (3) bias caused by incomplete outcome data, (4) bias due to the measurement of outcome and (5) bias due to the

selective reporting. The result of the assessment of the risk of bias will be presented in a risk of bias summary graph.

Data analysis

Bayesian NMA with a random-effects model will be performed by using WinBUGS V.1.4.3 to synthesize all evidence for each outcome. Compared with the frequentist approach, the Bayesian framework can benefit decision making, which can help create stable estimates and their credible intervals, which is further advantageous for making probabilistic statements and predictions on the treatment effects more straightforward.[28] Besides the Bayesian NMA, conventional pairwise meta-analyses with a random-effects model will be employed for the comparison between active treatments and control arms by using Stata V.16. as a reference for the results of NMAs.

For continuous outcomes, standardized mean difference (SMD) will be used as a measurement of effect size. We will use published mean values and standard deviations (SDs), if not available, we will estimate values by conversion from standard errors (SEs), *p* values, confidence intervals (CIs), or t-values. We will contact the authors of the study to obtain information if none of the above values is provided in the published paper. If we cannot obtain the information using this approach, missing SDs will be derived from those of the other studies using a validated imputation technique.[29] For the dichotomous outcome, the risk ratio (RR) and its 95% CIs will be calculated as effect sizes. Missing data will be managed with respect to the intention to treat (ITT) principle. Participants who drop out after randomization are regarded as non-responders.

In order to assess the transitivity assumption of NMA, we will assess the distribution of clinical and methodological variables.[30] Concerning clinical variables, we have assured the transitivity by limiting our samples to participants with DBDs and excluding participants with comorbid psychiatric disorders (autism spectrum disorder,

depressive disorder, anxiety disorder, etc.), or intellectual, or neurological, or physical disability. Other clinical or methodological variables that may influence the efficacy of psychosocial treatments include age, number of sessions, length of treatment.

Heterogeneity will be assessed using the I^2 statistic and its 95% confidence interval (CI). For visualization, the overlap of the CIs will be shown with forest plots. For the NMA, we assume a common heterogeneity variance across the various treatment comparisons and assess it with τ^2. Possible reasons for heterogeneity will be examined by subgroup analysis.

Furthermore, we will assess the global inconsistency as well as local inconsistency. Global consistency will be evaluated by calculating the design-by-treatment interaction test. The local inconsistency will be evaluated by comparing the disagreement between direct and indirect evidence in evidence loops. The results of the inconsistency test will be interpreted with caution because the test is known to have a low power.[31]

Finally, the surface under the cumulative ranking curve (SUCRA) and mean ranks will be used to summarize the probabilities of treatments and provide a hierarchy of competing treatments.

Subgroup analyses, meta-regression, and sensitivity analyses

If there are sufficient data in each subgroup, we will conduct a subgroup analysis to examine how treatment efficacy varies across different subgroups: (1) study setting (clinic, school, or community), (2) age group (3-10 years, 11-14 years, or 15-17 years), The age group is divided according to NICE-guidelines, in which parenting training programmes were recommended for 3-11 years, cognitive behavioural approaches were recommended for 9-14 years, and multimodal programmes were recommended for 11-17 years. (3) socioeconomic status, (4) outcome rater (composite, mother, father, teacher, child or observer) (5) age of onset of DBDs symptoms (3-10 years or

11-17 years) (6) diagnosis (formal diagnosis of ODD, formal diagnosis of CD or scale-assessed DBDs) and (7) country. Besides, we will conduct network meta-regression meta-analyses of data on the outcome of efficacy at post-treatment to evaluate the influence of the following potential moderators: (1) number of sessions, and (2) length of treatment, (3) fidelity (ie., the average implementing sessions divided by the total sessions of the programme), (4) baseline severity (SDQ, ASEBA, ECBI or RBPC score at baseline) (5) maternal mental health, (6) parent-child relationship, (7) parenting skills, and (8) parent readiness for treatment. Moreover, we will explore the sensitivity analyses by excluding: (1) studies in which missing data have been imputed, (2) studies in which high risk of bias rating have been assessed, and (3) studies in which participants comorbidity with ADHD have been included.

Publication bias

First, if ten or more studies are included in the NMA, funnel plots of pairwise NMAs will be examined. Moreover, comparison-adjusted funnel plots will be used to examine the association between study size and effect size. Furthermore, Egger's test will be used to examine the significance of publication bias.

Quality of the evidence

Grading of Recommendations Assessment, Development, and Evaluation framework specifically developed for NMA will be applied to evaluate the quality of evidence.[32] Specifically, we will characterize the credibility of a body of evidence on the basis of within-study bias, reporting bias, indirectness, imprecision, heterogeneity, and incoherence by using the CINeMA software.[33] The starting point for confidence in each network estimate is high but will be downgraded according to the assessments of the above six domains.

Ethics and dissemination

The NMA does not need ethical approval as no primary data are collected, and none human nor animal participants will be involved directly. Findings of the present research are planned to be published at national or international psychological conferences, or in a reputable scientific journal.

Patient and public involvement

No patient involved.

DISCUSSION AND SUMMARY

The systematic review and NMA will provide an overview and information on the comparative efficacy and acceptability of psychosocial treatments for children and adolescents with DBDs. The results will show a hierarchy of comparative efficacy with regard to symptoms of DBDs at post-treatment and follow-up, as well as in terms of acceptability, improvement of internalizing problems, and improvement of social functioning. Moreover, the results of subgroup analysis and meta-regression can help personalize the information to the youth, setting or other factors. To the best of our knowledge, this study will be the first NMA focusing on the treatment types rather than the delivery conditions in investigating the hierarchy of effectiveness and acceptability of psychosocial treatments for DBDs. The findings are expected to assist psychological counselors, psychotherapists, and social workers to make a better and evidence-based treatment choice.

It is worth noting that the findings need to be understood in light of study limitations. First, because of the fact that DBDs have high comorbidity with ADHD, we will not exclude trials with participants suffering DBDs comorbid with ADHD. Although results will reflect the real situation and contribute to more generalizable inferences, the risk of bias for outcomes will be raised. Second, when interpreting the results of NMA, we have to consider the heterogeneity of some variables (e.g. duration of the treatment), which are not always the same across psychosocial treatments. Last, it is

an excessive challenge to determine how to separate psychosocial treatments as independent nodes because some psychosocial treatments are multicomponent and vary in module, content, etc. In further research, we could conduct component NMA for a specific psychosocial treatment (eg CBT) to further investigate whether some components are superior to others in the DBDs treatment.

Contributors LZ designed this study and drafted the protocol. ZR, XM, DR, GJ, FY critically revised the protocol. LZ will screen search results for inclusion, conduct data extraction and data analysis and draft the final manuscript. XM, CZ will assist with data extraction and analysis and revise the final manuscript. ZZ and QL will screen search results for inclusion and conduct data extraction. All authors contributed to and have approved the final manuscript.

Competing interests The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as potential competing interests.

Funding This research was supported by the National Social Science Foundation of China (16CSH051).

Patient consent Not required.

Provenance and peer review Not commissioned; externally peer-reviewed.

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Table S1 Descriptions and examples of common psychosocial treatment types and control conditions

Treatments	Abbreviation	Description	Example (review or meta-analysis or trails)
Art Therapy	AT	AT uses art medium, including drawing, painting, clay to enable psychological change and personal growth of children and adolescents.	Moula[1]
Behavioral Therapy	BT	BT trains participants (children and adolescents, parents, teachers, etc.) using behavior management techniques such as differential reinforcement.	Axberg and Broberg[2]
Cognitive Behavioral Therapy	CBT	CBT combines BT with CT. CBT techniques commonly involve social skill training, cognitive restructuring, problem-solving, anger management.	Chen et al.[3]
Family Therapy	FT	FT works with youths and their families, in order to address family dysfunction by changing maladaptive patterns of interaction between family members, like parent-child interaction therapy.	van der Pol et al.[4]
Mindfulness	MBT	MBT trains youths' attentional awareness, strengthens the capacity of emotional and behavioral regulation and generates a shift in one's view of self.	Simpson et al.[5]
Multisystemic Therapy	MST	MST targets to address problems regarding environmental systems.	Tan and Fajardo[6]
Narrative Therapy	NAT	NAT uses narrative techniques like storytelling to cope with children and adolescents' aggression and anger.	Hosseini et al.[7]
Play Therapy	PT	PT copes with aggressive behavior, hostility, anger, etc. in recreational activities.	Bagherizadeh et al.[8]
Psychodynamic Therapy	DYN	DYN emphasizes youths' unconscious feelings and the effect of unconscious feelings on their behavior and emotions.	Weitkamp et al.[9]
Psychoeducation	PE	PE provides education or information to participants.	van der Put[10]
Control Conditions			
Treatment as Usual	TAU	TAU represents an usual treatment. It may involve in some components of psychosocial treatment and have some treatment effects, but is not a structured or formal psychosocial treatment.	-

Table S1 Descriptions and examples of common psychosocial treatment types and control conditions

Treatments	Abbreviation	Description	Example (review or meta-analysis or trails)
Waitlist	WL	WL means that participants in this control group receive any psychosocial treatments during the study, but are told they will receive one when the study finishes.	-
No treatment	NT	NT stands for that neither during the study nor the study finishes, participants in this control group will not receive any psychosocial treatments.	-

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Reported on Page
Administrative information			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	1
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	1
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	3
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	1, 16
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	
Support:			

Sources	5a	Indicate sources of financial or other support for the review	16
Sponsor	5b	Provide name for the review funder and/or sponsor	16
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	16
Introduction			
Rationale	6	Describe the rationale for the review in the context of what is already known	3-6
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	6
Methods			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	6-10
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	10-11
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	10-11
Study records:			

Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	11-12
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	11-13
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	11-12
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	12-13
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	9-10
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	12-13
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	13-16
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I2, Kendall's τ)	13-16
	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	14-15

	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	13-16
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	15
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	15

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.