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Mixed methods intervention studies in children and adolescents with emotional and behavioral disorders: A methodological review

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ABSTRACT

Background: Mixed methods intervention studies can improve the accuracy of interventional evaluations in the field of emotional and behavioral disorders by helping researchers gain a more nuanced understanding of how a particular intervention works. However, no studies to date have systematically examined the ways in which this type of studies have been carried out and reported.
Aim: To examine the methodological features and reporting practices found in mixed methods intervention studies in children and adolescents with emotional and behavioral disorders.
Method: Methodological review based on a systematic search from inception to July 2021 in Embase, Medline, PsycINFO, and SCOPUS, and a hand search in seven journals.
Results: We found 30 studies, most of them published since 2019. These studies reported several patterns of mixed methods use which illustrated the unique insights that researchers can gain by using this approach. We identified several ways that authors could more clearly report the justification for using a mixed methods approach, the description of the design used, and the evidence of integration of the quantitative and qualitative components.
Conclusion: We make recommendations for improving the reporting quality of mixed methods intervention studies in the field of emotional and behavioral disorders.

1. Introduction

Emotional and behavioral disorders (EBD) in children and adolescents require timely and effective interventions to avoid later adverse manifestations. In a recent review of EBD interventions in these populations, McKenna et al. (2021) argued that evaluations should have robust quantitative designs in order to generate high-quality, evidence-based knowledge that can inform future practice.

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However, these authors did not consider using mixed methods designs despite an extensive body of literature that describes a number of ways in which the efficiency, rigor, and comprehensiveness of intervention study designs is improved when qualitative approaches are combined with randomized studies and quasi-experimental approaches (Fetters & Molina-Azorin, 2020; Johnson & Schoonenboom, 2016; Lewin et al., 2009; O'Cathain, 2018; O'Cathain et al., 2013). Qualitative methods can help overcome some methodological limitations of quantitative research designs by helping researchers understand the context and conditions that affect interventions, and by affording them a more nuanced insight into how, why, and under what circumstances a particular intervention has worked.

Researchers have developed frameworks to help make explicit the rationales for integrating qualitative research into randomized controlled trials (RCTs) and other types of quantitative intervention designs. Johnson and Schoonenboom (2016) and Lewin et al. (2009) have used a temporal framework to clarify the rationale for adding a qualitative component to the design of an intervention study before, during, or after the interventional evaluation. For example, qualitative research carried out prior to an intervention can help researchers determine the need for the intervention and to identify elements that might make it either more or less effective. Using a qualitative component during the intervention can help researchers understand how well the intervention is being delivered and identify potential barriers and facilitators. After the intervention, researchers can use qualitative methods to explain unexpected or non-significative quantitative findings or to retrospectively assess the feasibility and acceptability of an intervention from the participant's perspective. Another way of classifying the rationales for including qualitative data in intervention research was proposed by O'Cathain (2018), who developed the "Aspects of a Trial Framework" using findings from a review of 296 health sciences articles that reported qualitative research used in combination with randomized trials. This framework classified the reasons for including a qualitative component based on the following key aspects of trial design: the intervention, the design and procedures, the outcomes, the process, the outcome measures used, and the health condition addressed by the intervention. More recently, (Fetters & Molina-Azorin, 2020) pushed for comprehensive mixed methods intervention evaluations to emphasize that the entire intervention should be evaluated continuously.

While these frameworks have provided practical guidance for the design and conduct of mixed methods intervention studies, methodological reviews in the health sciences have shown that such studies often suffer from limitations in methodology and reporting practice. Lewin et al. (2009), reviewing RCTs of complex healthcare interventions, found that most of the included studies which used qualitative research combined with RCTs did not report a clear rationale for mixing methods, and that the two components were either integrated insufficiently or not at all. Also, O'Cathain et al. (2013) found that authors often did not explicitly report both the contribution of the qualitative component to the study design and its added value. These methodological limitations can prevent researchers from being able to maximize the potential benefits of the unique insights afforded by the use of a mixed methods approach (Bazeley, 2017; Fàbregues & Molina-Azorín, 2017).

In developmental disabilities research, Midgley et al. (2014) used a mixed methods evaluation of a therapy for adolescent depression as an example to show how a mixed methods approach can characterize details of behavior change in complex interventions and to support the implementation of findings. The authors argued that RCTs can no longer be considered the "gold standard" for generating evidence of the effectiveness of behavioral interventions because, when used alone, they lack a sufficient basis for comprehensively and meaningfully evaluating complex interventions that address "real-world" issues such as depression and other developmental disabilities. More recently, the benefits of using qualitative methods in interventional behavioral research were highlighted in an international consensus study on priorities for methodological research in behavioral trials (Byrne et al., 2020).

In a systematic review of mixed methods studies about special education and disability research published between 2007 and July 2019 in 15 top-ranked journals, including *Research in Developmental Disabilities*, Corr et al. (2021) found only 43 articles that reported mixed methods studies (0.62% of the total number of articles published). Of these 43 articles, only six reported intervention studies. In addition to the few attempts to incorporate qualitative research in intervention designs in this field, to date no reviews have been published that have systematically examined these studies. This gap is surprising given the ways in which mixed methods intervention designs can help bridge the divide between researchers and practitioners in EBD by creating context-specific practical knowledge easily transferable to clinical practice (Dattilio et al., 2010). For instance, by considering the individual complexity of each child, mixed methods findings may allow practitioners to better understand why two children with EBD may respond differently to an intervention or may integrate intervention outcomes differently in their daily lives (Midgley et al., 2014). Mixed methods approaches may also facilitate the identification of mediators and moderators of intervention effectiveness that otherwise could not be identified, such as therapeutic alliance (Duppong Hurley et al., 2017) or therapist theoretical allegiance (Young et al., 2020). The transferability of research findings to clinical practice facilitated by mixed methods intervention designs is especially important in the field of EBD among children and adolescents where, according to McKenna et al. (2021), "there is limited research to inform practice for young children who are formally identified with EBD" (p. 140).

Thus, an examination of the methodological features and reporting practices of mixed methods intervention designs is needed to determine whether the added value of mixed methods is being realized in EBD and whether the previously mentioned methodological limitations of mixed methods intervention designs in the health sciences are also present in this field. To address this need, our review examines the methodological features and reporting practices found in mixed methods intervention studies in children and adolescents with EBD. Our study had the two following aims: (1) to describe the characteristics and methodological features of mixed methods intervention studies of children and adolescents with EBD, and (2) to examine the reporting quality of these studies. We aim to contribute to the practice of studies of EBD by describing the ways mixed methods research can support the effective and comprehensive evaluation of EBD interventions, and by providing recommendations for reporting mixed methods intervention studies in this field. As argued by O'Cathain (2018), detailed and transparent reporting is essential to ensure that the unique insights gained through the use of a mixed methods approach have been clearly communicated.

2. Material and methods

2.1. Design

We carried out a methodological review. Reviews of this type have been recently defined as studies that systematically examine methodological practice in the design, conduct, analysis, and reporting of primary studies (Mbuagbaw et al., 2020). Since they inform and evaluate the state of the art of research practice in a specific area, such reviews help researchers to expand and refine their methodological repertoire, and to identify methodological gaps and research needs. In the conduct and reporting of this review, we have followed the updated 2020 version of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021).

2.2. Search strategy

We conducted a systematic search of the literature to identify relevant publications using a strategy developed working together with an informationist from the Taubman Health Sciences Library of the University of Michigan (see Appendix A for the complete search query). The performance of the search strategy was tested by pre-selecting a few relevant articles (i.e., sentinel articles meeting the inclusion criteria) and determining whether they were being retrieved in our search query. We searched the title, abstract, author-supplied keywords, and (when appropriate) controlled subject headings of the publications indexed from inception through July 2021 in the following four databases: Ovid MEDLINE® and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions, Embase (via Elsevier), PsycINFO (via EBSCOHost), and Scopus (via Elsevier). We used search terms related to the following four concept areas: mixed methods (e.g., mixed method*, multimethod, mixed study), childhood (e.g., child, juvenile*, pediatric*), intervention (e.g., intervent*, program*, counsel*), and EBD (e.g., attention deficit, hyperactiv*, depression). Given the lack of clarity and consensus in the literature regarding the definition of EBD (Kauffman & Landrum, 2018; Mundschenk & Simpson, 2014), for each of the main types of disorders suggested by Kauffman and Landrum (Kauffman & Landrum, 2018), we identified the related terms using the DSM-5 as a guide. No limits were placed on language and publication year. After downloading the search results and merging them into an EndNote file, we eliminated duplicates using a modified version of the Bramer method (Bramer et al., 2016). The search was carried out in November 2020 and updated in July 2021. As documented in previous methodological reviews (Fàbregues et al., 2020) many authors do not use the term "mixed methods", or related terms, to describe their methods. Therefore, in order to identify mixed methods intervention studies that could not be identified by database searches, we hand searched the following seven journals specialized in developmental disabilities from inception to July 2021: *American Journal on Intellectual and Developmental Disabilities*; *Behavior Disorders*; *Intellectual and Developmental Disabilities*; *International Journal of Disability, Development and Education*; *Journal of Emotional and Behavioral Disorders*; *Journal of Positive Behavior Interventions;* and *Research in Developmental Disabilities*. These journals were selected because they are well-respected and established in the field of developmental disabilities (e.g., they are indexed in the Journal Citation Reports), they have an international scope, they publish intervention studies as well as empirical articles using a variety of methodological approaches, and they cover a range of disciplinary fields, including special education, rehabilitation, and psychology.

2.3. Selection process

To select the studies included in the review, we used the inclusion and exclusion criteria shown in Table 1. To ensure greater homogeneity in the types of research reports appraised, we included only journal articles. Journal articles are the primary means by

Table 1
Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
• The intervention targets children and adolescents aged between 2 and 18. At least half of the children and adolescents must have been diagnosed with an EBD included in the DSM-5. Disorders must have been identified through responses to a standardized test or through professional assessment. Parents, teachers, and other acquaintances of the children and adolescents could have been participants in the intervention. • The study evaluates an intervention in children with EBD. Online interventions are also included. • The study must report quantitative research. The outcomes of interest are specific or related children EBD outcomes, which must have been assessed using pretest and posttest measures. • The study must report qualitative research carried out before, during, or after the quantitative component. • Peer-reviewed journal articles in English. There were no limitations regarding the publication date.	• The study does not evaluate the effectiveness of an intervention. • The primary outcomes of the intervention are not related to EBD. • The article reports a stand-alone qualitative study or a stand-alone quantitative study that was part of a broader mixed methods study. • Articles published in a language other than English. • Articles not reporting the results of an empirical study (e.g., protocol or editorial). • Dissertation or non-peer reviewed article. • Articles reporting systematic reviews or single case designs.

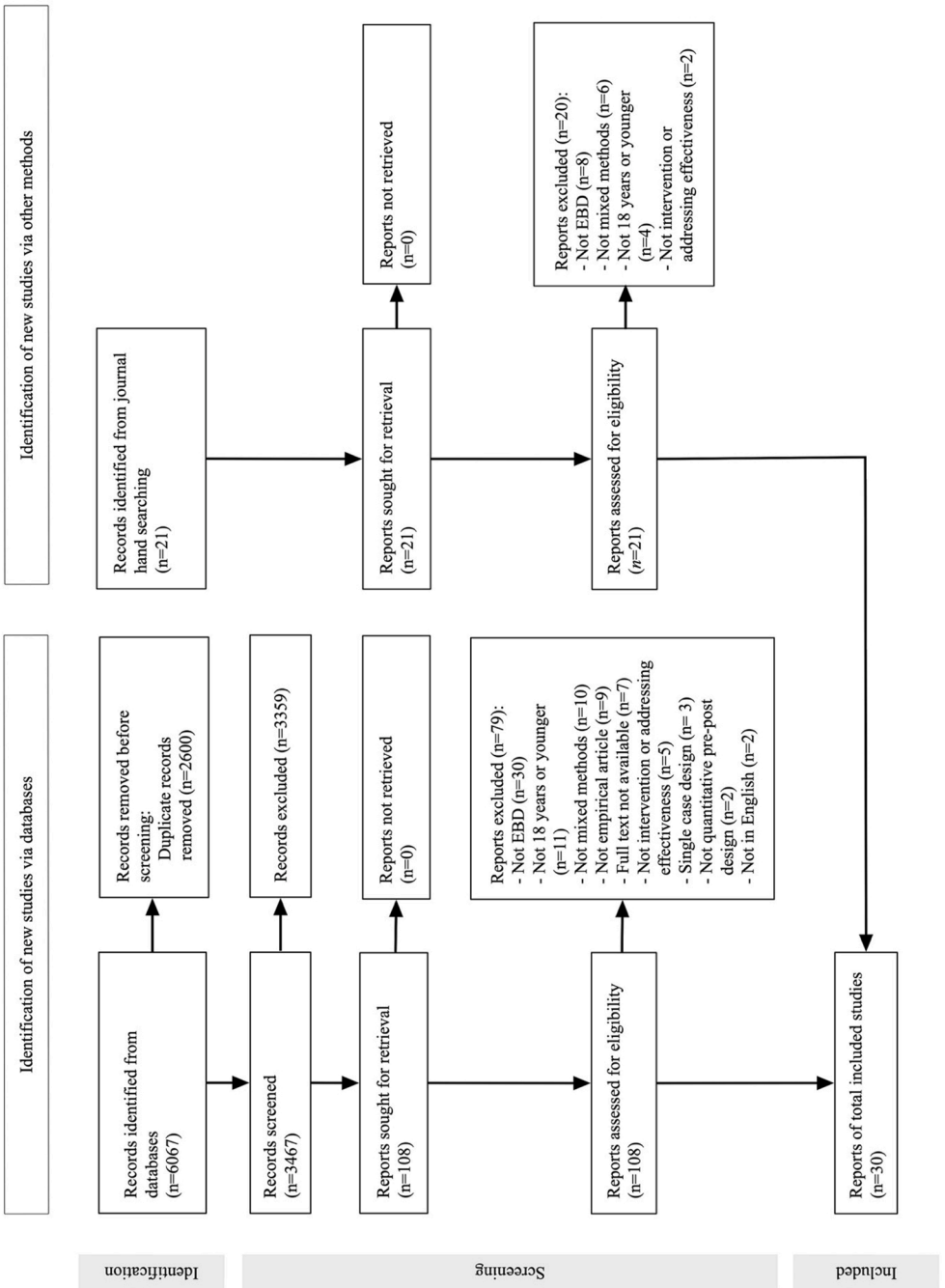

Fig. 1. PRISMA flowchart.

Table 2
Characteristics of the included studies in the review (n = 30).

Study (year)[a]	Journal name	Country of the intervention	Type of disorder (s) targeted by the intervention	Intervention name	Sample	QUAN research purposes	QUAL research purposes
Ames et al. (2014)	Child and Adolescent Mental Health	UK	Depression	Mindfulness-Based Cognitive Therapy (MBCT)	7 adolescents	Efficacy, feasibility	Effectiveness, feasibility, acceptability
Au et al. (2014)	Australian Psychologist	China	ADHD	Level 4 positive parenting program (Triple P)	17 caregivers of grade-schoolers	Efficacy	Effectiveness
Auslander et al. (2017)	American Journal of Orthopsychiatry	USA	Depression, PTSD	Girls Aspiring toward Independence (GAIN)	27 adolescents	Effectiveness, feasibility, fidelity, acceptability	Acceptability, feasibility
Cale et al. (2020)	European Physical Education Review	UK	Anxiety, stress	Get to the Start Line	50 adolescents, 5 providers	Effectiveness	Effectiveness, feasibility fidelity, acceptability
Cho et al. (2021)	School Psychology Review	USA	Anxiety, depression, behavior problems	Show Me FIRST	34 adolescents, 8 providers	Effectiveness, feasibility	Effectiveness, feasibility
Damra et al. (2014)	Counseling Psychology Quarterly	Jordan	Depression, PTSD	Trauma-Focused Cognitive Behavioral Therapy (TF-CBT)	18 grade-schoolers and caregivers, 14 providers	Efficacy	Effectiveness, feasibility, acceptability
Enggaard et al., 2021)	Issues in Mental Health Nursing	Denmark	ADHD	Guided-Self-Determination	10 adolescents and caregivers	Effectiveness	Effectiveness
Frey et al. (2020)	Pilot and Feasibility Studies	Germany	Depression	Treatment of adolescent depression in an inpatient setting (TADS-in)	29 adolescents, 6 providers, 1 nurse	Effectiveness, fidelity	Effectiveness, feasibility
Gabrielsen et al. (2019)	International Journal of Adolescence and Youth	Norway	Depression, anxiety, behavior disturbance	Friluftsterapi wilderness	32 adolescents	Effectiveness	Effectiveness
Giombini et al. (2019)	Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity	UK	Anorexia nervosa	Cognitive Remediation and Emotion Skills Training (CREST)	32 grade-schoolers and adolescents, 3 providers	Effectiveness, acceptability	Effectiveness, feasibility, acceptability
Giombini et al. (2021)	Neuro-psychiatrie	UK	Anorexia nervosa	Cognitive Remediation and Emotion Skills Training (CREST)	30 grade-schoolers and adolescents	Effectiveness	Effectiveness, feasibility, acceptability
Gowers et al. (2010)	Health Technology Assessment	UK	Anorexia nervosa	Inpatient and outpatient psychiatric treatment	215 adolescents and caregivers	Effectiveness, acceptability	Acceptability
Haight et al. (2010)	Children and Youth Services Review	USA	Behavior problems	Life Story Intervention (LSI)	15 grade-schoolers and adolescents, and caregivers, 4 providers	Effectiveness, feasibility	Effectiveness, feasibility
Kamody et al. (2020)	Eating Disorders	USA	Binge eating, emotional overeating	Emotional Overeating Intervention (EOI)	15 adolescents	Effectiveness	Effectiveness, acceptability
Langberg et al. (2011)	School Mental Health	USA	ADHD	Homework, Organization, and Planning Skills (HOPS)	11 grade-schoolers and adolescents, 10 providers, 8 teachers	Effectiveness, fidelity, acceptability	Effectiveness, feasibility, fidelity, acceptability
Lantz et al. (2021)	Scandinavian Journal of Psychology	Sweden	ADHD	SKILLS psychoeducational group program	125 grade-schoolers and adolescents, and caregivers	Effectiveness, acceptability	Effectiveness, acceptability
Lenz et al. (2014)	Counseling Outcome Research and Evaluation	USA	Depression, anxiety	Partial hospitalization program (PHP)	35 adolescents, providers	Effectiveness	Effectiveness, acceptability
Levanon-Erez	British Journal of Occupational Therapy	Israel	ADHD	Teen Cognitive-Functional (Cog-Fun)	27 adolescents and caregivers	Efficacy, feasibility	Effectiveness

(*continued on next page*)

Table 2 (*continued*)

Study (year)[a]	Journal name	Country of the intervention	Type of disorder (s) targeted by the intervention	Intervention name	Sample	QUAN research purposes	QUAL research purposes
et al. (2019)							
Meek et al. (2020)	The Cognitive Behavior Therapist	UK	Anxiety	Anxiety Gremlins	36 grade-schoolers and adolescents and caregivers, 3 providers	Effectiveness	Feasibility
Myburgh et al. (2021)	Child Care in Practice	South Africa	Anxiety	I am Brave	21 grade-schoolers and adolescents	Effectiveness	Effectiveness
Neth et al. (2020)	RMLE Online	USA	Depression, anxiety	Strong Kids	10 adolescents, teachers	Effectiveness, fidelity	Acceptability
Norton et al. (2019)	Journal of Child Adolescent Trauma	USA	Depression, PTSD	Family Enrichment Adventure Therapy (FEAT)	32 grade-schoolers and adolescents and caregivers	Efficacy	Effectiveness
Nussey et al. (2014))	Child and Adolescent Mental Health	UK	Tourette syndrome	Psychoeducational intervention (classroom presentation)	4 grade-schoolers and caregivers, 100 classmates, 5 teachers	Effectiveness	Effectiveness
Park et al. (2019)	Behavior & Information Technology	Korea	ADHD	Fairy tale-based interactive narrative intervention	5 grade-schoolers and caregivers	Effectiveness	Effectiveness
Sibley et al. (2014)	Cognitive and Behavioral Practice	USA	ADHD	Supporting Teens' Academic Needs Daily-Group (STAND-G)	23 adolescents and caregivers	Efficacy, acceptability	Effectiveness, acceptability
Sibley, Coxe, et al. (2020)	Journal of Clinical Child & Adolescent Psychology	USA	ADHD	Summer Treatment Program-Adolescent (STP-A)	218 adolescents and caregivers, teachers	Effectiveness	Effectiveness
Sibley, Morley, et al. (2020)	School Psychology Review	USA	ADHD	Students Taking Responsibility and Initiative through Peer Enhanced Support (STRIPES)	90 adolescents	Effectiveness, feasibility, fidelity, acceptability	Feasibility
Wilkinson et al. (2018)	Evidence Based in Mental Health	UK	Depression	Interpersonal Counseling (IPC)	23 grade-schoolers and adolescents, 5 providers	Effectiveness	Acceptability
Woollett et al. Woollett et al. (2020)	Child Abuse & Neglect	South Africa	Depression, PTSD	Trauma-informed art and play therapy	21 grade-schoolers and adolescents, and caregivers	Effectiveness	Effectiveness
Zhang et al. (2017)	Mindfulness	China	ADHD	Mindfulness-Based Intervention MYmind intervention	11 grade-schoolers and adolescents, and caregivers	Effectiveness, feasibility, acceptability	Effectiveness, feasibility, acceptability

Note. Grade-schoolers include ages 5–11 years. Adolescents include ages 12–18 years. QUAN = Quantitative, QUAL = Qualitative.
[a] Studies are presented in alphabetical order.

which intervention studies are disseminated to academic and non-academic audiences. At the beginning of the selection process, two reviewers carried out a pilot test of the screening procedure with 10% of the sample to refine the criteria. In the screening phase, the same two reviewers independently screened the titles and abstracts of all the publications. In the eligibility phase, the two reviewers independently assessed their full texts and documented the reasons for exclusion. Disagreements in all the phases were resolved by consensus.

2.4. Data extraction and synthesis

We used qualitative content analysis (Schreier, 2012) to extract and synthesize data from the included studies in four phases. In Phase 1, we read a sub-sample of twelve of the included studies to familiarize ourselves with the literature base that we needed to synthesize. These studies covered a range of disorders and included varying levels of detail in their method reporting. We began this phase by pre-selecting five studies and continued reading others until the diversity of characteristics in the dataset had been adequately

achieved. The work carried out in Phase 1 allowed us to anticipate potential adjustments to the extraction tool that we would develop in the next phase. In Phase 2, we generated an extraction form informed by the literature on mixed methods intervention studies, by previous methodological reviews of mixed methods research, by the Good Reporting of a Mixed Methods Study (GRAMMS) guidelines (O'Cathain et al., 2008), and by the (Fetters et al., 2013) typology of integration procedures (see Appendix B for the extraction form). The extraction form, represented in columns in the output matrix, was pilot tested independently by two reviewers using a random sample of ten studies. Several extraction categories were refined, and additional categories were added as a result of the pilot study. For example, we added four new extraction categories (i.e., purpose and time point assessed in the quantitative and qualitative components) and modified one GRAMMS criterion (i.e., criterion 4) to allow for a more precise assessment of the reporting of evidence of integration in the included articles. In Phase 3, three reviewers extracted passages from the included studies and inserted them into the output matrix in Excel using the extraction scheme developed in Phase 2. For each study, the passages were extracted independently by two reviewers. Any disagreements were discussed until a consensus was reached with the mediation of a third reviewer when necessary. Finally, in Phase 4, *synthesis*, we reviewed all the extracted passages, and compared them to identify similarities and differences in the methodological features of the studies.

3. Results

The search strategy generated 3467 records after removing duplicates. An additional 21 records were identified via handsearching. After assessing eligibility, we included 30 studies in our methodological review. The reasons for excluding publications are shown in Fig. 1, which illustrates the PRISMA flow diagram of the review process.

3.1. Characteristics of the included studies

Table 2 shows the characteristics of the included studies. Of the 30 studies, 18 were published in 2019–2021, nine in 2014–2018, and only three before 2011 (see Appendix C for a year-by-year figure of the publication year). They were published in journals from a range of fields, including emotional and behavioral disorders, occupational therapy, child abuse and neglect, mental health nursing, counseling psychology, educational psychology, clinical psychology, and psychology in general. The interventions reported in the studies took place in Europe ($n = 12$), North America ($n = 11$), Asia ($n = 5$) and Africa ($n = 2$). Over half of the European interventions were carried out in the United Kingdom ($n = 8$). Most of the interventions addressed disorders associated with anxiety/PTSD ($n = 11$), depression ($n = 11$), and ADHD ($n = 10$), while fewer addressed eating disorders ($n = 4$), behavior ($n = 3$), and motor and vocal tics ($n = 1$). Over half were in adolescents ($n = 16$), one-third ($n = 9$) in both adolescents and grade-schoolers, and five in grade-schoolers only. In half of the interventions, the child was accompanied by at least one adult, either a caregiver ($n = 15$), an intervention provider ($n = 10$), or a teacher ($n = 4$).

Consistent with our inclusion criteria, all the included studies ($n = 30$) used the quantitative component to evaluate the effectiveness/efficacy of the intervention, while half of them ($n = 14$) also used the quantitative component to evaluate other domains of the intervention, such as its acceptability ($n = 8$), feasibility ($n = 7$), and fidelity ($n = 5$). The perceived effectiveness of the intervention was evaluated in the qualitative component in over three-quarters of the studies ($n = 24$). For instance, Cale et al. (2020) used focus groups to examine adolescents' "perceived effect" (p. 647) of an intervention that addressed school-related stress and anxiety. Similar terms such as "perceived benefits" (Sibley et al., 2014, p. 33), "perceived impact" (Enggaard et al., 2021), and "perceived outcomes" (Gabrielsen et al., 2019, p. 283) were used in other studies. Other intervention domains evaluated in the qualitative component were acceptability ($n = 15$), feasibility ($n = 13$), and fidelity ($n = 2$). To describe mixed methods, more than two-thirds of the studies ($n = 22$) used the term "mixed methods" or related terms such as "mixed methodology" or "mixed research method." Only 10 studies cited a methodological publication on mixed methods research to justify the use of that approach or describe its procedures, and the works of Professor John W. Creswell were the most frequently cited. In addition, of these 10 studies, only one cited a publication specifically focused on mixed methods intervention studies.

3.2. Reporting quality and methodological features

Table 3 describes the reporting quality of the 30 studies in terms of their performance in relation to each of the six GRAMMS guidelines (O'Cathain et al., 2008) (see Appendix D for a detailed description of the GRAMMS and Appendix E for the ratings assigned to each study). Table 4 provides further details of the methodological features of the studies.

3.2.1. Justification for using mixed methods research

As shown in Table 3, 17 studies explicitly justified the use of a mixed methods design (GRAMMS guideline 1) by citing reasons such as maximizing the researchers' understanding of how participants might benefit from the intervention "in a deeper perspective" (Au et al., 2014, p. 153), carrying out a "comprehensive evaluation of both the process and perceived influence and impact of the intervention" (Cale et al., 2020, p. 645), or using the qualitative results to "develop the context for understanding the quantitative results" (Lenz et al., 2014, p. 7). In 12 studies that did not include an explicit justification, the justification could be inferred from the quantitative and qualitative objectives, while it was impossible to determine the justification in only one study. Examining these justifications, along with the integration outcomes reported by each study, and additional information in the discussion section, we were able to identify 10 rationales for the use of mixed methods that illustrate the specific ways in which the use of mixed methods can be helpful in evaluating the effectiveness, feasibility, and acceptability of EBD interventions. The most prevalent rationales involved

Table 3
Reporting quality of the included studies in the review based on an adapted version of the GRAMMS guidelines (n = 30).

Guideline	Yes[a]	Yes, but[a]	No[a]
1) Describes the justification for using mixed methods research to the research question	17	12	1
2) Describes the mixed methods design in terms of the purpose, priority, and sequence of methods	7	5	18
3) Describes each method in terms of sampling, data collection and analysis	25	5	0
4) Reports evidence of integration[b]	25	2	3
5) Describes any limitation of one method associated with the presence of the other method	0	0	30
6) Describes any insights gained from mixing or integrating methods	13	1	16

[a] These categories are described in detail in Appendix D.
[b] For the purpose of this study, the authors reformulated the original guideline number 4.

using the qualitative findings to enhance the understanding of the quantitative outcome ($n = 13$), contrasting the quantitative and qualitative findings regarding effectiveness to help establish their validity, and employing the qualitative component to explore details of the acceptability ($n = 8$) and feasibility ($n = 7$) elements that were not reported in the quantitative component. Table 4 shows which rationales were identified in each study, and Table 5 shows examples of these rationales.

3.2.2. Mixed methods design

In general terms, the information concerning the type of mixed methods design used (GRAMMS guideline 2) was reported in only a minority of studies, as shown in Table 4. In only seven studies, the authors specified the type of design used and described design features such as the priority (i.e., the weight of each component within the overall design) and order (i.e., the timing in which of they are implemented) of the quantitative and qualitative components. Five studies failed to report the name of the design, although they provided a precise description of the order of the components. The majority of the studies ($n = 18$) neither named the mixed methods design nor offered any information about its features.

Of the seven studies that explicitly reported the type of design, four reported using an explanatory sequential design, two a convergent design, and one a multiple case design. When an explanatory sequential design was used, the study began with a quantitative phase, followed by a qualitative phase that helped explain some of the quantitative findings. This design was used in a study by Gabrielsen et al. (2019), in which the authors evaluated the effectiveness of the Friluftsterapi wilderness therapy program in adolescents with depression, anxiety, and behavior disturbance. It began with a quasi-experimental phase, followed by interviews with the adolescents. The findings helped the researchers explain in greater depth two of the questions that arose from the quantitative findings about the "influential processes at the time of the post-test" (p. 288) and the "post-treatment processing and perceived effects of Friluftsterapi" (p. 288). Convergent designs entail independent collection and analysis of quantitative and qualitative data, followed by merging both types of data to compare or combine them (Creswell & Plano Clark, 2018). In a convergent mixed methods study that evaluated the impact of the Guided Self-Determination intervention in adolescents with ADHD and a co-existing medical disorder, Enggaard et al. (2021) compared findings from survey with interview data from the same participants to assess how each type of data "confirmed, expanded or contradicted [the] other" (p. 4). This comparison allowed the authors to draw meta-inferences about the primary study constructs and achieve a greater understanding of the effectiveness of the intervention. Finally, one study (Nussey et al., 2014) was labeled a multiple case design but did not show the characteristics associated with this type of design as described in the qualitative and mixed methods literature.

3.2.3. Quantitative and qualitative components

The quantitative and qualitative methods used (GRAMMS guideline 3) were adequately reported in most of the studies. In 25 studies the sampling, data collection, and analysis stages in each component were reported completely. In the remaining five studies, reporting of these three stages was almost complete, three did not report the quantitative analysis methods, and two did not report qualitative methods. Table 4 shows the type of design and the data collection method used in the 30 studies included in the review. Single-group pre- and post-treatment designs were used in the quantitative component in 17 studies, multiple-group pre- and post-treatment designs in seven, and RCTs in six. Only two studies reported the qualitative designs used, and these were constructivist grounded theory and phenomenology. The quantitative data collection method was a questionnaire in nearly all of the studies ($n = 29$), with only a few using other quantitative methods, such as observation checklists ($n = 4$) and school records ($n = 4$). In the qualitative component, studies used a greater variety of methods, including semi-structured and in-depth interviews ($n = 17$), focus groups ($n = 12$), open-ended questions or written feedback ($n = 7$), field notes ($n = 2$), archival records ($n = 1$), and observation ($n = 1$). While the quantitative data was collected at different times during the intervention in all the studies, the qualitative data was frequently collected only after the intervention ($n = 24$).

3.2.4. Integration

Nearly all the studies ($n = 25$) reported explicit evidence of integrating the quantitative and the qualitative findings (GRAMMS guideline 4). Two studies did not explicitly report integration, but the integration outcomes could still be inferred from details included in the results section, and three did not report integration in any way as they entirely failed to consider how the two types of data related to each other. In the sub-sample of 27 studies that explicitly or partially reported integration, we used (Fetters et al., 2013) typology of integration procedures to classify the ways in which integration was carried out. Twenty-six studies integrated through merging, six through building, and two through connecting. When merging was used, the quantitative and qualitative databases were

Table 4
Summary of mixed methods features of the included articles (n = 30).

Study (year)[1]	MMR rationales (number from Table 5)	Reported mixed methods design	QUAN design and methods	QUAL design and methods	Stage of QUAL research with respect to the intervention	Integration at the methods level	Integration at the reporting level	Description of the MMR insights gained
Ames et al. (2014)	1, 10	NR	SGPPTD, questionnaire	Semi-structured interviews	After	Merging	Narrative	NR
Au et al. (2014)	1, 5	NR	RCT, questionnaire	Focus groups	After	Merging	Narrative	Explicit
Auslander et al. (2017)	8	NR[2]	MGPPTD, QUAN interview, attendance log, observation checklist, satisfaction questionnaire	Focus groups	Before	Building	Narrative	NR
Cale et al. (2020)	1, 7, 10	NR	SGPPTD, pupil's school data	Constructivist grounded theory, semi-structured interviews, focus groups	Before and during	Merging	Narrative	NR
Cho et al. (2021)	2, 8, 9	NR[2]	RCT, questionnaire	Semi-structured interviews	After	Merging	Narrative	NR
Damra et al. (2014)	1, 7, 10	NR	RCT, questionnaire	Semi-structured interviews	After	Merging	Narrative	NR
Enggaard et al. (2021)	1, 2, 3, 5	Convergent	SGPPTD, questionnaire	Semi-structured interviews	After	Merging	Narrative, joint display	Explicit
Frey et al. (2020)	7	NR	SGPPTD, questionnaire, observation checklist	Focus groups	After	Merging	Narrative	Explicit
Gabrielsen et al. (2019)	1, 2	Explanatory sequential	SGPPTD, questionnaire	Participant observation and interviews	After	Merging, building	Narrative	Explicit
Giombini et al. (2019)	2, 7	NR	SGPPTD, questionnaire	Semi-structured interviews	After	Merging	Narrative	Explicit
Giombini et al. (2021)	2, 7, 10	NR	SGPPTD, questionnaire	Written feedback	After	Merging	Narrative	Partial
Gowers et al. (2010)	10	NR[2]	RCT, questionnaire	Focus groups, open-ended questions	After	Merging, building, connecting	Narrative	NR
Haight et al. (2010)	1	NR[2]	MGPPTD, questionnaire	Semi-structured interviews, archival records, open-ended questions, field notes	During and after	Merging	Narrative	Explicit
Kamody et al. (2020)	2, 10	NR	SGPPTD, questionnaire	Semi-structured interviews	After	Merging	Narrative	Explicit
Langberg et al. (2011)	3, 6, 7	NR	SGPPTD, questionnaire, observation checklist	Focus groups	After	Merging	Narrative	Explicit
Lantz et al. (2021)	1, 2	NR	SGPPTD, questionnaire	Open-ended questions	After	Merging	Narrative	Explicit
Lenz et al. (2014)	1, 10	Explanatory sequential	SGPPTD, questionnaire	Phenomenology, focus groups	After	Merging, building	Narrative	Explicit
Levanon-Erez et al. (2019)	1	NR	SGPPTD, questionnaire	Semi-structured interviews	After	Merging	Narrative	NR
Meek et al. (2020)	7	Explanatory sequential	MGPPTD, questionnaire	Semi-structured interviews	After	Merging, building	Narrative	Explicit
Myburgh et al. (2021)	1, 3, 6	NR	MGPPTD, questionnaire	Focus groups	After	Merging	Narrative	Explicit

(*continued on next page*)

Table 4 (*continued*)

Study (year)[1]	MMR rationales (number from Table 5)	Reported mixed methods design	QUAN design and methods	QUAL design and methods	Stage of QUAL research with respect to the intervention	Integration at the methods level	Integration at the reporting level	Description of the MMR insights gained
Neth et al. (2020)	10	Convergent	MGPPTD, questionnaire, observation checklist	Semi-structured interviews, focus groups, field notes	During and after	NEI	NEI	NR
Norton et al. (2019)	1	NR[2]	MGPPTD, questionnaire	Focus groups	After	Merging, connecting	Narrative	NR
Nussey et al. (2014)	1	Mixed methods multiple case study	SGPPTD, questionnaire	Semi-structured interviews, focus groups	Before and after	Merging	Narrative	Explicit
Park et al. (2019)	2	NR	SGPPTD, questionnaire	In-depth interviews	After	Merging	Narrative	NR
Sibley et al. (2014)	2	NR	MGPPTD, questionnaire, attendance and school records	Open-ended questions	After	NEI	NEI	NR
Sibley, Coxe, et al. (2020)	2, 4	NR	RCT, questionnaire, school records	Open-ended questions	After	Merging	Narrative	NR
Sibley, Morley, et al. (2020)	8, 9	NR	Open trial, RCT, questionnaire, observation checklists, attendance and school records	Open-ended questions	After	Merging, building	Narrative	NR
Wilkinson et al. (2018)	10	NR	SGPPTD, questionnaire	Semi-structured interviews	After	NEI	NEI	NR
Woollett et al. (2020)	4	Explanatory sequential	SGPPTD, questionnaire	In-depth interviews	Before and after	Merging	Narrative	NR
Zhang et al. (2017)	3	NR	SGPPTD, questionnaire	Semi-structured interviews, focus groups	After	Merging	Narrative	NR

1Studies are presented in alphabetical order.

2Studies that provide a precise description of the component timing but do not report the type of design.

Note. QUAN = Quantitative, QUAL = Qualitative, MMR = Mixed methods research, RCT = Randomized controlled trial, SGPPTD = Single group pre-post treatment design, MGPPTD = Multiple group pre-post treatment design, NA = Not applicable, NEI = Not evidence of integration, NR = Not reported.

Table 5
Rationales for using a mixed methods research approach.

Rationale	Example
Effectiveness	
1. QUAL provides an enhanced understanding of the QUAN outcome ($n = 13$)	In Au et al. (2014), the findings from the RCT showed that the Triple P Program for parents of children with ADHD increased parental self-efficacy. Focus groups with the parents revealed that the precursors of such an increase were their more significant knowledge about ADHD and their greater empathy towards the children.
2. QUAL confirms or disconfirms QUAN intervention findings to ascertain their validity ($n = 10$)	Enggaard et al. (2021) observed a convergence between the SGPPTD and the semi-structured interview findings that allowed the researchers to be more confident that the GSDADHD-MD intervention did not affect parental support.
3. QUAL explains negative QUAN outcomes ($n = 4$)	In Myburgh et al. (2021), the MGPPTD findings revealed that the I am Brave intervention effectively reduced anxiety scores in children aged 11–14 years but did not show the same positive results in children aged 9–10 years. Focus groups with the children allowed the authors to identify several developmental factors that explained the lack of effectiveness of the intervention in younger children.
4. QUAL identifies additional benefits to those represented by the positive QUAN outcomes ($n = 2$)	The findings resulting from open-ended questions allowed Sibley, Coxe, et al. (2020) to identify several low- and high-intensity benefits from the STP-A program for adolescents with ADHS that could not be measured with the QUAN measurement battery.
5. QUAL allows researchers/providers to understand the contextual barriers to the effectiveness of the intervention ($n = 2$)	Based on the focus group findings, Au et al. (2014) concluded that parents could not persistently implement the strategies to teach their children that were presented in the Triple P program because of a lack of available time after work.
6. QUAL helps refine the intervention content and structure to increase its effectiveness ($n = 2$)	Langberg et al. (2011) used the focus group data to add a missing component to the HOPS intervention for adolescents with ADHD in order to increase the teacher-rated intervention effects.
Feasibility	
7. QUAL explores feasibility elements not examined in the QUAN component ($n = 7$)	In Cale et al. (2020), interviews with providers revealed several difficulties in implementing the Get(ting) to the Start Line program, including a lack of knowledge about the program and time pressures.
8. QUAL helps refine and optimize intervention feasibility ($n = 3$)	Using data from semi-structured interviews with providers, Cho et al. (2021) identified several modifications that would help improve the feasibility of the Try the Opposite intervention, such as allowing additional sessions and greater flexibility concerning the number of sessions.
9. QUAL explains QUAN findings showing a lack of feasibility ($n = 2$)	In Sibley, Morley, et al. (2020), the findings from the open-ended questions allowed the authors to conclude that the lack of feasibility of the STRIPES intervention was due to considerations specific to particular disorders and developmental stages.
Acceptability	
10: QUAL explores acceptability elements not examined in the QUAN component ($n = 8$)	Based on semi-structured interviews, Ames et al. (2014) concluded that adolescents enjoyed the group experience provided by the MBCT

Note. QUAN = Quantitative, QUAL = Qualitative, SGPPTD = Single group pre-post treatment design, MGPPTD = Multiple group pre-post treatment design.

linked for analysis or comparison in the final stages of the study. An example of integration through merging was found in Woollett et al. (2020) explanatory sequential mixed methods study evaluating a trauma-informed intervention. By bringing together in the interpretation stage data from a single group pre-post treatment design with data from interviews, the authors could identify qualitative findings regarding intervention effectiveness that complemented and expanded the quantitative findings on this same topic. When building was used, the quantitative findings guided the subsequent qualitative data collection or analysis, and when connecting was used, the quantitative findings orientated the qualitative sampling that was done later. For example, in a building strategy employed by Gowers et al. (2010), the authors used themes identified in a quantitative questionnaire to create a focus group guide that included associated themes. In this same study, the authors also employed a connecting strategy by purposefully sampling participants for post-intervention focus groups based on their exposure to one of the three treatments that had previously been evaluated in the quantitative component.

Using the (Fetters et al., 2013) typology, we also classified the ways in which integration was reported. All studies that evidenced integration ($n = 27$) used a narrative approach to report the linkage between the two types of data. The authors used terms such as "supported" or "confirmed" when the quantitative and qualitative findings agreed. Terms such as "diverged" or "only partially supported" were used when they disagreed. Finally, terms such as "provided valuable insight" when one type of data expanded the other type. In most cases, the integration narrative was presented in the discussion section ($n = 19$). Occasionally it was presented in the results section ($n = 3$) or in both the results and the discussion sections ($n = 2$) (information not provided in Table 4). In only one study (Enggaard et al., 2021), joint display figures were used to visually represent the relationship between the qualitative and quantitative findings and to describe the meta-inferences resulting from the assessment of the fit (i.e., confirmation, discordance, or expansion) between the two types of data.

3.2.5. Limitations and insights

None of the articles reported limitations arising from using one methodological approach associated with the use of the other approach (GRAMMS guideline 5). In contrast, over half of the articles provided an explicit ($n = 13$) or partial ($n = 1$) description in the

discussion or conclusion sections of the insights gained from using a mixed methods approach (GRAMMS guideline 6). These descriptions complemented the rationale for integrating methods previously described by highlighting how the use of mixed methods helped to enable "not only the testing of a priori hypotheses but also the discovery of unexpected findings" (Frey et al., 2020, p. 12), and to generate "insight that easily could have remained obscured if the data were not allowed to 'communicate'" (Gabrielsen et al., 2019, p. 294). Some studies also emphasized how a deeper understanding of patients' experiences achieved through qualitative methods allowed researchers to develop "a more effective targeted inpatient group treatment program for ED [emotional difficulties]" (Giombini et al., 2019, p. 611), and to understand how a partial hospitalization program for adolescents with depression and anxiety "has been contextualized by participants and what aspect of treatment has remained meaningful over time" (Lenz et al., 2014, p. 13).

4. Discussion

This is the first methodological review that examines the ways in which mixed methods intervention designs have been used and reported in the field of EBD in children and adolescents. We identified a number of rationales for using mixed methods research in EBD interventions which reveal how this methodological approach can help researchers in this field to achieve a more in-depth and nuanced understanding of the effects of an intervention. Consistent with recent reviews that reported the growing popularity of mixed methods intervention studies in high-income Western countries (Clement et al., 2018; Lewin et al., 2009; O'Cathain et al., 2013), most of the included studies were published in the last three years by authors affiliated with universities in the UK and the US. In a review by Clement et al. (2018), the authors found that registered trials reporting qualitative methods in three international registries increased in frequency from 0 in 1999 to 285 in 2016. They attributed this finding to the publication of key methodological works on qualitative research combined with trials such as Lewin et al. (2009) and O'Cathain et al. (2013). Despite the recognized influence of these works, only one study included in our review cited them. Nevertheless, they cited other relevant mixed methods sources and they also incorporated in their design several of the mixed methods rationales described in these methodological publications. These patterns demonstrate that authors of the studies included in our review considered the potential of this methodological approach for EBD intervention research. More precisely, the review findings reveal several ways in which a mixed methods approach helped generate context-specific findings relevant to and transferrable to EBD clinical practice. For instance, the adoption of a mixed methods approach allowed researchers to determine why some interventions worked for some groups of participants but not others. This was observed in Myburgh et al. (2021), who used focus groups to identify the reasons why an anxiety-reduction intervention worked in children ages 9–10 but not in younger children. In other cases, such as Au et al. (2014), this approach enabled researchers to uncover the contextual elements that contributed to participants' failure to integrate the strategies learnt during the intervention into their daily lives. In other instances, the use of mixed methods allowed researchers to increase the contextual validity of the EBD intervention by exploring how the participants perceived it, such as in Ames et al. (2014). These findings demonstrate the value of mixed methods research in generating context-sensitive evidence-based knowledge that can be used to improve practice in EBD intervention research.

Overall, the studies included in our review showed an acceptable level of reporting quality that reflected the authors' awareness of the key components that should be included in a mixed methods report. However, we identified gaps that indicate room for improvement. In most of these studies, the authors explicitly or implicitly reported a justification for using a mixed methods design. This finding contrasts with previous reviews of mixed methods intervention studies in the health sciences (Brown et al., 2015; Lewin et al., 2009; O'Cathain et al., 2013) that found low numbers of studies in which such justification was provided. However, in many cases this justification could have been clearer and more detailed and could have included a more precise description of the specific insights that the authors expected to gain from the mixed methods design. As also found by O'Cathain et al. (2013), because of this lack of detail, we needed to examine other study elements, such as the integration outcomes, in order to clearly identify the rationales listed in Table 5. A lack of clarity and accuracy in the reporting of the mixed methods rationales was also observed by Corr et al. (2021) in their review of mixed methods research in special education and disability research.

We observed a similar trend in the reporting of the integration of the quantitative and qualitative findings. Most of the studies showed evidence of integration, confirming that the authors were conscious of the unique insights provided by the mixed methods approach over a monomethod approach. Also, since they collected quantitative and qualitative data about overlapping constructs, mainly relating to intervention effectiveness, the authors of most of the included studies may well have planned the integration from the design stage of the study. This approach is in consistent with one of the integration strategies highlighted in the mixed methods literature, for instance, by Creamer (2018). However, in many cases, if the authors had reported the integration outcomes in more explicit detail, they could have achieved further integration. Only one study used joint displays to report integration, even though (Guetterman et al., 2015) cited this technique as the most efficient tool for representing the integration of quantitative and qualitative findings and describing the resulting meta-inferences in a mixed methods study. Also, in contrast to recommendations in the mixed methods literature (Creamer, 2018; O'Cathain et al., 2007), the authors often limited the reporting of integration to a few statements in the discussion section, rather than explicitly describing the potential interrelations between the two sets of findings in the results section. By addressing these two limitations, authors of future mixed methods intervention studies in children and adolescents with EBD could make integration more visible, thereby maximizing the additional insights gained through the use of mixed methods.

The mixed methods design used was adequately reported in only a minority of the studies. As found in previous reviews of mixed methods intervention studies (Brown et al., 2015), most authors reported the designs with insufficient detail. Several studies did not mention the type of design used, and most did not describe the priority, timing and, particularly, the point of integration of the quantitative and qualitative components. Furthermore, none of the studies in our review included a diagram to visually represent the design, which would have helped readers more easily grasp the intent of the type of integration used by the authors.

4.1. Recommendations

From a methodological perspective, the aspects of these studies that were best reported were the justifications for using mixed methods research, the descriptions of the procedures followed in the quantitative and qualitative components, and the evidence of integration. However, even in these areas, reporting was inconsistent. In Table 6, we provide six recommendations that could help researchers improve the reporting of mixed methods EBD intervention studies based on the reporting shortcomings we identified in the studies we reviewed. We consider that these six recommendations represent the essential components of a high-quality and well-reported mixed methods intervention study. By following these recommendations, researchers can ensure that the potential of this methodological approach for conducting a more comprehensive evaluation of an EBD intervention is clearly communicated to the readers.

Table 6
Recommendations for reporting mixed methods intervention studies in the field of EBD.

- Provide a detailed justification for using a mixed methods intervention design that explicitly defines the unique insights that the authors expect to gain for that particular EBD evaluation
- Describe, both narratively and using a visual diagram, the details of the mixed methods intervention design used, including the timing and point (s) of integration of the quantitative and qualitative components
- Provide a transparent description of the procedures followed in carrying out the quantitative and qualitative components, independently of the weight of each of these in the overall mixed methods design
- Provide explicit evidence of the mixed methods integration through the use of joint displays and describe the interrelations between the quantitative and qualitative findings in the results section
- Report the extent to which using a mixed methods approach allowed the authors to gain the unique insights previously mentioned in the justification for using this approach
- Cite key methodological publications, preferably on mixed methods intervention designs, to demonstrate that sound methodological and reporting practices have been followed and that the authors have considered the range of rationales for using such designs

4.2. Limitations

Our review was subject to three main limitations, all of which were related to the search strategy used by the researchers. First, since we based our search strategy on terms related to mixed methods research, we might have overlooked studies that used other terms to describe their methods. That said, it is unlikely that such studies would have used up-to-date procedures if they were not even self-identified as mixed methods studies. Second, we acknowledge that it is particularly challenging to search for literature about interventions, since authors may use a wide variety of terms to describe this topic. However, if we had not limited our search strategy specifically to interventions, we would have retrieved far too many search results to reasonably conduct a review. When balancing the specificity and sensitivity of our search strategy, the informationist carefully tested a number of potentially relevant terms related to interventions (such as train*, engage*, strateg* and educat*) before discarding them and deciding on our final search. Our use of the controlled vocabulary of the databases (when possible) and the hand-searching of six journals also helped minimize the effects of this limitation on our review. Third, the search was restricted to four databases: two in the health sciences (i.e., Embase and Medline), one in psychology (i.e., PsycINFO), and one that encompassed various disciplines (i.e., Scopus). Databases from other disciplinary fields (i.e., CINAHL and ERIC) could also have been searched. However, due to the size of our result set in the four databases initially searched, we chose not to expand our search to other databases.

5. Conclusions

While the reporting quality was acceptable in most of the included studies, their findings could have been enhanced by more detailed reporting of the justification for the use of mixed methods and the type of mixed methods design used. Based on this review, we were able to identify several ways in which authors of mixed methods intervention designs can strengthen the significance of their study findings. In addition, as O'Cathain et al. (2007) observed in a key review of integration practices, by more explicitly reporting the integration of the quantitative and qualitative findings, researchers might have been able to better exploit the potential afforded by using a mixed methods approach to achieve a more comprehensive and nuanced evaluation of an intervention targeting children and adolescents with EBD.

What this Paper Adds

While it is well documented that the application of mixed methods research designs could help researchers achieve more robust and comprehensive evaluations of interventions, no prior studies have examined the use of this type of design in evaluating interventions in children and adolescents with emotional and behavioral disorders (EBD). This methodological review fills a gap in knowledge by examining the methodological features and reporting quality of mixed methods intervention studies in young populations with

disorders of this type. We assessed the additional insights gained from using mixed methods research in designs of this type, as well as the extent to which these insights were clearly communicated by the authors. We identified several rationales for using mixed methods research to assess the effectiveness, feasibility, and acceptability of complex EBD interventions. We also found that while the reporting quality of the studies was acceptable, it could be improved by including a more detailed description of the rationale for using a mixed methods approach, the type of mixed methods design used, and the outcomes of integrating the quantitative and qualitative components. Based on the review findings, we provide a number of recommendations to guide and enhance mixed methods practice and reporting in the of field of developmental disabilities.

CRediT authorship contribution statement

Sergi Fàbregues: Conceptualization, Data curation, Formal analysis, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Cristina Mumbardó-Adam:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – review & editing. **Elsa Lucia Escalante-Barrios:** Conceptualization, Formal analysis, Methodology, Writing – review & editing. **Quan Nha Hong:** Formal analysis, Methodology, Writing – review & editing. **Dick Edelstein:** Formal analysis, Writing – original draft, Writing – review & editing. **Kathryn Vanderboll:** Methodology, Writing – review & editing. **Michael D. Fetters:** Methodology, Writing – review & editing.

Declarations of interest

None.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.ridd.2022.104239.

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