


# The efficacy of online parenting interventions in addressing emotional problems in children and adolescents: A meta-analysis of randomized controlled trials

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International Journal of  
Social Psychiatry  
1–13  
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DOI: 10.1177/00207640231156034  
journals.sagepub.com/home/isp  


## Abstract

**Background:** Parenting interventions offer opportunities for reducing emotional problems in children and adolescents, based on addressing parental risk and protective factors. Online parenting interventions were developed more recently to increase access to interventions for parents, and the aim of this systematic review and meta-analysis is to investigate their efficacy.

**Methods:** We conducted a meta-analysis pooling studies that tested online parenting interventions having as outcome emotional problems in children/adolescents. We considered as secondary outcome parent mental health and moderation effects for the type of population, intervention characteristics, and risk of bias.

**Results:** Thirty-one studies met the inclusion criteria and were included in the meta-analysis. For child/adolescent emotional problems, at post-intervention, 13 studies were pooled, yielding an ES of  $g = -0.26$  (95% CI  $[-0.41, -0.11]$ ;  $p < .001$ ) favoring the online parental interventions over wait-list, while at follow-up five RCTs were pooled, yielding an ES of  $g = -0.14$  (95% CI  $[-0.25, -0.02]$ ;  $p = .015$ ) favoring the parental online interventions over wait-list. Moderation analyses suggest that longer online parenting programs are more effective in improving child emotional problems.

**Conclusions:** Online parent programs have positive effects on reducing emotional symptoms in children and adolescents. Future research will need to develop and investigate the efficacy of the programs that can personalize their contents and delivery methods.

## Keywords

Online parenting intervention, parent mental health, child behavior, emotional problems

## Introduction

Emotional disorders are the most common mental health problems affecting youths, with percentages of 10% up to 20% of the youths meeting the criteria for anxiety or depression disorders at any point during childhood and adolescence (Gore et al., 2011). Moreover, studies report a high degree of co-morbidity of emotional disorders with behavioral disorders during childhood and afterwards (Ogundele, 2018). Consequently, childhood mental disorders are associated with negative outcomes, such as a considerable degree of lifetime persistence, greater symptom severity, social, and academic impairments (Kessler et al., 2012).

The role of parenting as both protective and risk factor for emotional disorders in childhood has been well documented. Indeed, a recent review (Yap et al., 2014) showed

that interparental conflict, parental over involvement, and averseness contribute significantly to the development of emotional disorders in childhood. At the same time, it was

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found that parental dimensions such as warmth, monitoring, and autonomy granting can function as protective factors for anxiety and depression in youths. Thus, compelling evidence (see Cairns et al., 2014) suggests that by targeting modifiable parenting factors, emotional disorders in youths could be prevented and addressed in the long run.

Parenting interventions or programs (e.g. skills training) are evidence-based psycho-educational interventions that target the improvement of parent practices for addressing child mental health concerns. Cognitive-behavioral parent programs are currently considered treatment of choice for child behavioral disorders (NICE Clinical Guidelines, 2017). While studies have systematically shown that parenting programs can be effective for improving long-term child behavioral outcomes across development, positive results have been also delineated for child emotional symptoms (Cairns et al., 2014; Dishion et al., 2016; Stormshak et al., 2018). Moreover, among the investigated mechanisms of such programs, parental distress, and depression have been documented to moderate their efficacy, suggesting that they can block the intergenerational transmission of emotional difficulties.

Since the internet is considered a popular source of information for parents, online parenting interventions have been developed to increase their accessibility. Many parent program curricula have online, or computerized versions and their efficacy has been well documented in terms of reducing child behavioral disorders, and in improving parenting practices and distress (see Florean et al., 2020; Spencer et al., 2020; Thongseiratch et al., 2020), physical, and psychological health (Flujas-Contreras et al., 2019). There have been a few initiatives so far to develop or adapt parent program curricula for addressing child emotional disorders. The Partners in Parenting (PiP) program is such a curriculum (Yap et al., 2017, 2018), which builds on recent advances on parent risk and protecting factors for emotional disorders in youths to automatically tailor the program based on parents' identified improvement areas. The PiP was found effective in improving parenting, with long term reduction in terms of adolescent depressive symptoms (Yap et al., 2019). The RETHink Parenting is another such initiative which was adapted based on the Rational Positive Parenting Program (David, 2019) to address child emotional disorders, using the multi-level tailoring assessment of PiP, and capitalizes besides addressing risk/protective parenting on addressing parent early maladaptive schemas and effectively responding to own and child emotional needs.

In this meta-analysis we aim at analyzing the efficacy of online parenting interventions that target emotional disorders in children and adolescents. We aimed to respond to the following questions: 1. What is the efficacy of online parental interventions that are delivered online in preventing or reducing (a) child/adolescent emotional disorders or internalizing problems as a cluster, but also specifically

child anxious or depressive symptomatology when considered separately? and (b) parental mental health problems and/or emotional distress; 2. How does the efficacy of online parental interventions vary as a function of different moderators, namely clinical status of the children, the type of control group (i.e. passive control groups like waitlist vs active interventions), the age of the children, intervention duration (i.e. number of sessions), study quality (as indicated by the risk of bias score), and if there is a directed focus of the intervention on child emotional health or the program is focused on child behavior problems?

## Method

### *Identification and selection of studies*

The meta-analysis was prospectively registered (PROSPERO registration number CRD42022303170). Potentially relevant studies were identified following a comprehensive search of the PsychINFO, PubMed, Scopus, Cochrane Central Register of Controlled Trials (CENTRAL) and Web of Science databases through December 2021. The search was subsequently updated in September 2022. We also inspected references from the most recent systematic reviews and meta-analyses (Florean et al., 2020; Flujas-Contreras et al., 2019; Thongseiratch et al., 2020). We employed the following string in searching through the databases: (emotional disorder OR internalizing OR depressive disorder OR depressi\* OR anxiety OR anxiety disorder) AND (program OR training OR education\* OR intervention\*) AND (parent\*) AND (online OR internet OR web OR mobile).

Studies were included if they were (a) randomized controlled trials (RCTs) in which (b) an online or technology-mediated parenting intervention was compared with (c) any passive control (no treatment, waitlist) or active control comparators (treatment/care as usual, placebo, bibliotherapy, and face-to-face interventions), but not another online treatment/intervention in order to (d) improve child/adolescent emotional problems (i.e. internalizing problems and anxious/depressive symptomatology) and/or parental distress, anxious and/or depressive symptomatology. We also included studies in which an online parental intervention was employed for improving outcomes other than child/adolescent emotional problems (such as behavior problems), but which reported on parental distress, anxious, and/or depressive symptomatology. We excluded studies that included parents of children with traumatic brain injury, chronic pain, intellectual disabilities, Down syndrome, or cancer, due to primary focus on coping with the condition. Two researchers (MD and IM) independently screened all abstracts, subsequently examined full texts and selected eligible RCTs. All disagreements were resolved by discussion and consultation with a third author (LAF) until consensus was reached.

### Quality assessment and data extraction

For quality assessment we used the Risk of Bias (RoB) assessment tool, developed by the Cochrane Collaboration (Higgins et al., 2016), which assesses possible sources of bias in RCTs. We rated the following domains: (a) random sequence generation, (b) allocation concealment, (c) blinding of participants and personnel, (d) blinding of outcome assessors, (e) incomplete outcome data, and (f) selective outcome reporting. For domain (d), participants were considered their own assessors if they completed self-report scales (Higgins et al., 2016), with ratings of low risk given if they were blinded to the intervention. Domain (e) was assessed as low risk if all randomized participants were included in the analysis, through the use of an intent-to-treat (ITT) approach or all data was available. Domain (f) was assessed as low risk if primary and secondary outcomes were pre-specified in a prospectively registered protocol or trial registration, with no substantial changes between registration and publication.

For each of the included studies, we extracted (a) the identification data (i.e. first author, publication year), (b) intervention target (if the study targeted children's behavior problems/parental mental health or targeted children's internalizing problems/parental mental health), (c) children's primary symptoms, (d) children's mean age, (e) the technology that was employed in delivering the parental intervention, (f) the intervention type (i.e. self-directed or therapist-assisted), (g) the intervention modality (i.e., standard intervention or tailored intervention), (h) the name of the intervention, (i) the intervention focus (delivered only to parents or to parents plus children), (j) the number of sessions/intervention modules, (k) control group type, and (l) the risk of bias score (computed by attributing 1 point for each domain rated as low risk of bias and then computing a sum, for each study). Moreover, we extracted data related to the clinical status of the sample that was employed in the primary studies. The samples were considered to have clinical or non-clinical status based on the presence or absence of a formal diagnosis (i.e. when it was mentioned that they met the diagnostic criteria on a validated clinical instrument).

### Meta-analysis

We computed effect sizes (ES) for each comparison between an online parental intervention and a passive or active control condition or between an online parental intervention and all aggregated control conditions, both at post-intervention (in case of sensitivity and subgroup analyses) and at follow-up, with the magnitude of the ES being directly proportional with the magnitude of the difference between conditions. Hedge's  $g$  was chosen as the indicator for the ES, having the advantage that it accounts for bias in small samples (Hedges & Olkin, 1985). ESs

were computed from means, standard deviations, and sample sizes. A statistically significant negative value of the ES is indicative of the superiority of the online parental intervention over the control condition. If this data was not available, the ES was computed by using the available statistics (e.g.  $t$ -values for group comparisons,  $p$ -values, and sample sizes). For each study, outcomes from an intention-to-treat analysis were preferred, while completer samples were used only when intention-to-treat samples were not provided.

Given the variability of the outcomes, we grouped them in (1) child emotional problems (which were split, in subsequent sensitivity analyses, in child emotional symptoms, child anxiety symptoms, and child depressive symptoms), (2) parental distress, (3) parental anxiety symptoms and (4) parental depression symptoms. If a study used more than one outcome from the same category or if the same outcome was measured by more than one instrument, an average ES was computed using the procedure provided by the Comprehensive Meta-Analysis software (Borenstein et al., 2009), that assumes a correlation of 1 between outcomes.

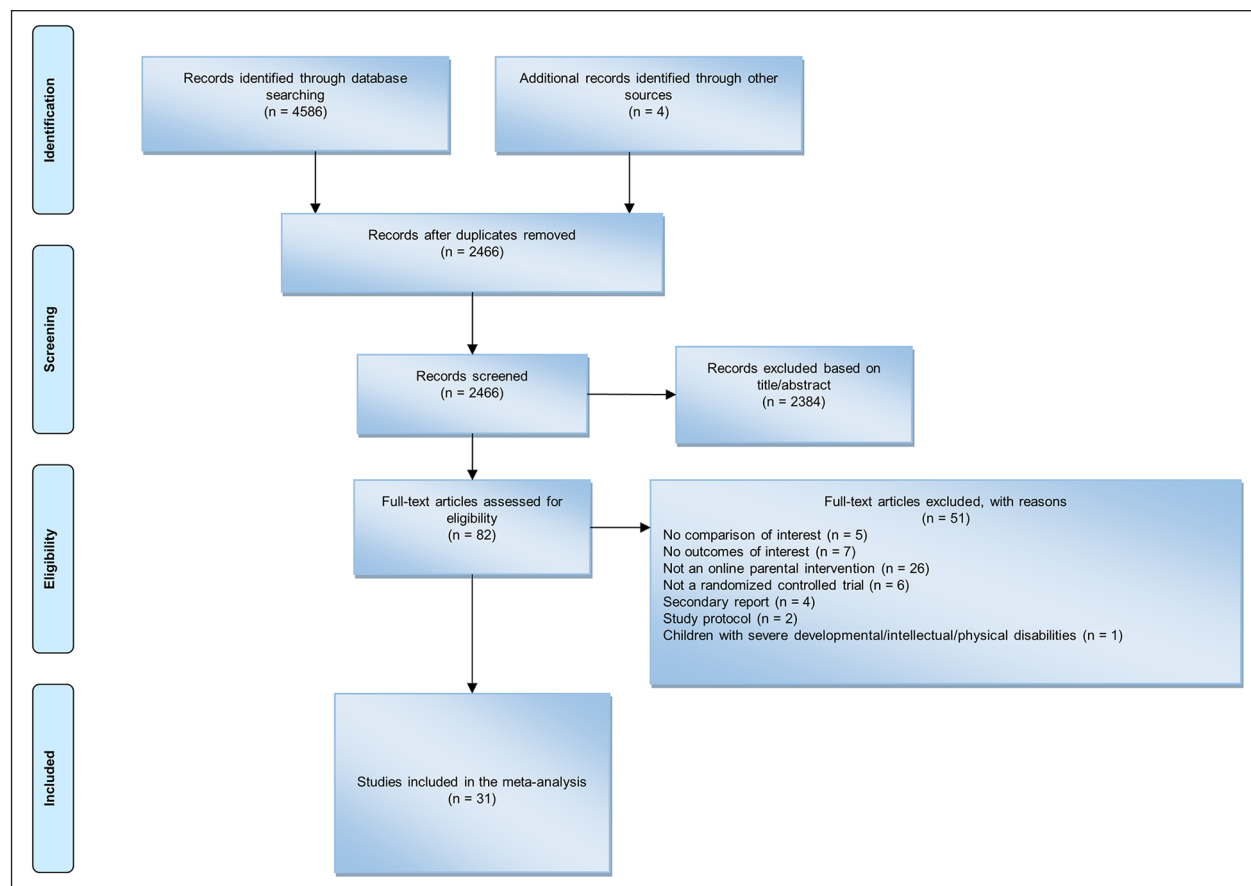
As a considerable degree of heterogeneity between studies was expected, we employed a random-effects model in all analyses. Heterogeneity was quantified with the  $I^2$  statistic, where a value of 0% indicates no observed heterogeneity,  $\leq 25\%$  indicates low heterogeneity,  $\leq 50\%$  indicates moderate heterogeneity, and 75% and above indicates high heterogeneity. In order to further investigate possible sources of heterogeneity, we conducted sensitivity and subgroup analysis, where possible (i.e. subgroup analyses were conducted if we had at least four studies per subgroup; Fu et al., 2011). Meta-regressions were employed for testing the potential influence of continuous moderators, using a restricted maximum likelihood model with the Knapp-Hartung method (Borenstein et al., 2009). Publication bias was evaluated via a visual inspection of the funnel plots, while we also employed the Duval and Tweedie trim and fill procedure (Duval & Tweedie, 2000) of investigating small study effects.

All analyses were conducted with Comprehensive Meta-Analysis (CMA version 3.3.070) and Stata (Stata SE, version 16).

## Results

### Selection and inclusion of studies

The search generated 4,586 records, with four other records identified through other sources, of which 2,466 records remained after duplicate removal. We excluded 2,384 records, based on title and abstract inspection, and examined the full text for 82 articles. Figure 1 reports the flowchart of the inclusion process following the PRISMA guidelines (Moher et al., 2009). Following the additional elimination of 51 articles, we retained 31 articles that met



**Figure 1.** PRISMA study flow chart.

the inclusion criteria, one of which represented a 12-month follow-up for one of the retained articles (Table 1).

### Characteristics of the included studies

The 30 RCTs included 33 relevant comparisons, with 2,148 participants in the online parental conditions and 2,217 participants in the passive or active control conditions, at post-intervention. The most frequent primary symptoms of the children/adolescents were behavioral problems (in 14 out of the 30 RCTs). Only 10 out of 30 of the parent programs had, as their focus, targeting emotional disorders in children (e.g. anxiety and depression) or parent emotional outcomes (e.g. parent distress), while the others were programs targeting primarily child behavior problems. The most used technological avenue through which interventions were delivered was some type of online web-based platform (in 25 out of the 30 RCTs). Most of the parental interventions were self-directed (in 22 out of the 30 RCTs), while most of the online interventions offered no participant-tailored content and/or feedback (in 22 out of the 30 RCTs). In all RCTs the online parental intervention was delivered exclusively to the parents, without engaging the children/adolescents directly and the

most used control group type was the waitlist (in 17 out of the 30 RCTs). The active controls consisted of attentional control, parent education, self-help contents (e.g. workbook), or face to face parent programs. Thirteen studies employed a follow-up measurement, with follow-up lengths varying between 3 and 12 months, the most employed follow-up duration being 6 months (in 6 studies). Only two studies were three-armed RCTs which employed both wait-list and active control arms (Table 1).

### Risk of bias of the included studies

Most of the studies were rated as having an unclear or elevated risk of bias in three of the six domains (Figure 2). Only two studies were rated as having low risk of bias on all six domains, while six studies were rated as having low risk of bias on five out of the six domains. For sequence generation and allocation concealment, 18 out of the 30 RCTs were rated as having a low risk of bias, while in only 8 RCTs the participants, personnel and outcome assessors were blinded to the intervention. Most of the studies presented complete data or used an intent-to-treat approach (in 25 out of the 30 RCTs), while only 10 studies were rated as having a low risk of bias for the selective reporting domain.

**Table 1.** Characteristics of the included studies.

Study	Children's primary symptoms	Intervention target	Children's mean age	Technology type	Intervention type	Intervention modality	Intervention name	Intervention focus	Number of sessions/modules	Type of control group	Risk of bias score
M. Baker et al. (2015)	EP, BP, and AP	Internalizing problems and/or parental mental health	3.5	WB	TA	STD	Emotional Attachment and Availability Intervention Triple P	Parents	5	WL	1
S. Baker et al. (2017)	BP	Behavior problems and/or parental mental health	4.4	WB	SD	STD	Chicago Parent Program	Parents	5	WL	4
Breitenstein et al. (2016)	BP	Behavior problems and/or parental mental health	N/A	APP	SD	STD	Partners in Parenting (PIP) Program	Parents	6	AC	3
Cardamone-Breen (2018)	NS	Internalizing problems and/or parental mental health	13.85	WB	SD	TLD	Integrated Family Intervention for Child Conduct Problems	Parents	10	AC	5
Dadds et al. (2019) Study 1/Study 2	Study BP	Behavior problems and/or parental mental health	6.77/7.24	VC	TA	STD	Triple P	Parents	8	WL	3
Day and Sanders (2018)	BP	Behavior problems and/or parental mental health	3.5	WB	SD	STD	BRAVE-ONLINE Program	Parents	8	WL	4
Donovan (2014)	AS	Internalizing problems and/or parental mental health	4.08	WB	TA	STD	Behavioral Parent Training Triple P	Parents	10	WL, AC	0
DuPaul et al. (2018)	ADHD	Behavior problems and/or parental mental health	4.43	WB	SD	STD	Parent Management Training	Parents	8	WL	1
Ehrensaft et al. (2016)	NS	Behavior problems and/or parental mental health	N/A	WB	SD	STD	Family Foundations	Parents	7	WL	5
Enebrink et al. (2012)	BP	Behavior problems and/or parental mental health	6.83	WB	SD	STD	Triple P	Parents	8	WL	1
Feinberg et al. (2020)	NS	Internalizing problems and/or parental mental health	N/A	WB	SD	STD	Parent Management Training	Parents	7	WL	5
Franke et al. (2016)	ADHD	Behavior problems and/or parental mental health	4	WB	SD	STD	Family Foundations	Parents	8	WL	3
Ghaderi et al. (2018)	BP	Behavior problems and/or parental mental health	N/A	WB	SD	STD	Triple P	Parents	8	WL	1
Jolstedt et al. (2018)	AS	Internalizing problems and/or parental mental health	10	WB	TA	STD	Parent Management Training	Parents	7	AC	5
Jones et al. (2017)	NS	Internalizing problems and/or parental mental health	N/A	WB	SD	STD	BIP Anxiety treatment protocol Integrated Bipolar Parenting Intervention / Triple P	Parents	12	AC	6
Khanna et al. (2017)	AS	Internalizing problems and/or parental mental health	10.1	WB	SD	TLD	Child Anxiety Tales	Parents	8	WL	5
MacKinnon et al. (2022)	NS	Behavior problems and/or parental mental health	2.16	APP+WB	TA	STD	Unified Protocol	Parents	10	AC	5
Morawska et al. (2014)	BP	Internalizing problems and/or parental mental health	6.06	POD	SD	STD	Triple P	Parents	7	WL	3

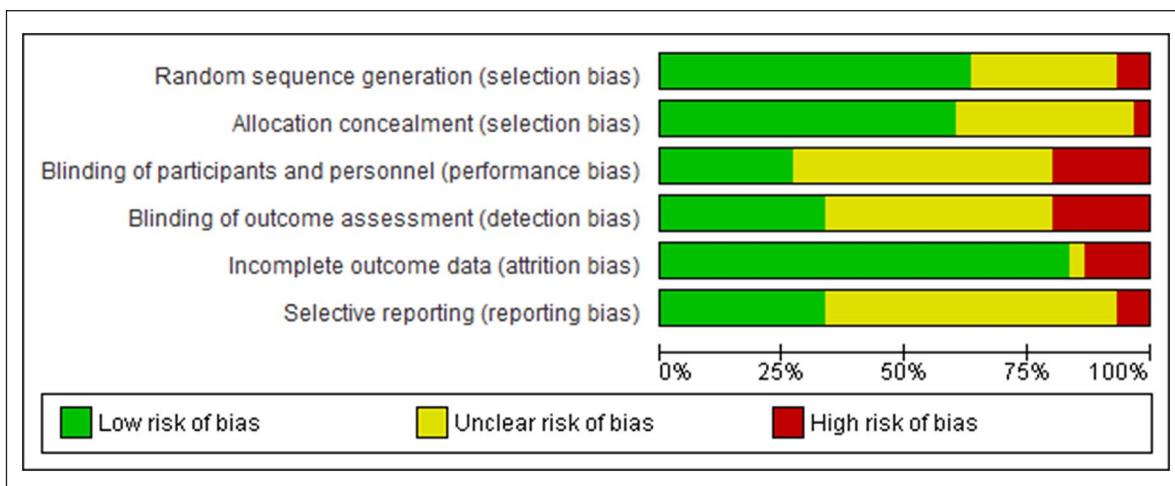
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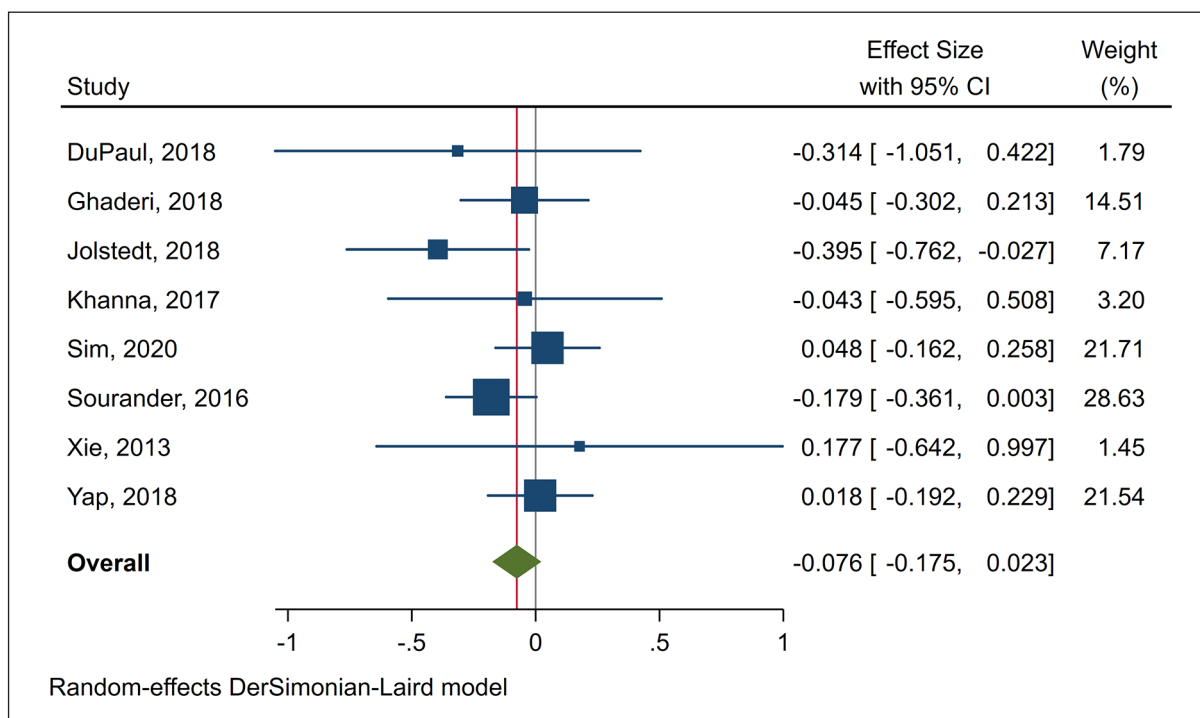
Table 1. (Continued)

Study	Children's primary symptoms	Intervention target	Children's mean age	Technology type	Intervention type	Intervention modality	Intervention name	Intervention focus	Number of sessions/modules	Type of control group	Risk of bias score
Morgan et al. (2017)	BP, EP, and AS	Behavior problems and/or parental mental health	4.8	WB	SD	STD	Cool Little Kids	Parents	8	WL	1
Porzig-Drummond et al. (2015)	BP	Behavior problems and/or parental mental health	5.27	Video	SD	STD	I-2-3 Magic	Parents	2	WL	3
Potharst et al. (2019)	NS	Behavior problems and/or parental mental health	N/A	WB	SD	STD	Mindful parenting training + Mindful training with your toddler	Parents	8	WL	1
Sanders et al. (2008)	BP and EP	Behavior problems and/or parental mental health	5.4	WB + Video	SD	STD	Triple P	Parents	10	AC	0
Sanders et al. (2012)	BP	Behavior problems and/or parental mental health	4.7	WB	SD	TLD	Triple P	Parents	8	WL	3
Sanders et al. (2014)	BP	Behavior problems and/or parental mental health	5.63	WB	SD	TLD	Triple P	Parents	8	AC	0
Sim et al. (2020)	NS	Internalizing problems and/or parental mental health	9.79	WB	SD	TLD	Parenting Resilient Kids (PaRK)	Parents	12	AC	4
Sourander et al. (2016)	BP	Behavior problems and/or parental mental health	4	WB	TA	TLD	Strongest Families	Parents	11	AC	4
Stormshak et al. (2019)	NS	Behavior problems and/or parental mental health	N/A	WB	TA	TLD	Family Check-Up	Parents	4	WL	2
Wetterborg et al. (2019)	BP	Behavior problems and/or parental mental health	14.1	WB	SD	STD	Parent-Web	Parents	5	WL	5
Xie et al. (2013)	ADHD	Behavior problems and/or parental mental health	10.37	VC	TA	STD	Barkley Training Program	Parents	10	AC	2
Yap et al. (2018)	NS	Internalizing problems and/or parental mental health	13.7	WB	SD	TLD	Partners in Parenting (PIP) Program	Parents	9	AC	4
Yap et al. (2019) (12-month follow-up for Yap, 2018)	NS	Internalizing problems and/or parental mental health	13.7	WB	SD	TLD	Partners in Parenting (PIP) Program	Parents	9	AC	4

Note. Risk of bias score was computed by adding one point for each criterion rated as 'low risk of bias' (min = 0, max = 6), higher scores indicating lower overall risk of bias. EP = emotional problems; BP = behavioral problems; AP = attachment problems; WB = web-based intervention; TA = therapist assisted/administered intervention; STD = standard intervention; SD = self-directed intervention; N/A = not available; APP = smartphone/tablet application; TLD = tailored intervention; NS = no symptomatology; VC = videoconference; ADHD = Attention deficit hyperactivity disorder; AS = anxiety symptoms; POD = online podcast; INT = internalizing symptoms; WL = waitlist; AC = active control; TAU = Treatment as usual; Standard intervention = Intervention that is based on a standard face to face intervention and offers no tailored content; Tailored intervention = Intervention that offers participant-tailored content.



**Figure 2.** Risk of bias graph – review authors’ judgments about each risk of bias item presented as percentages across all included studies.

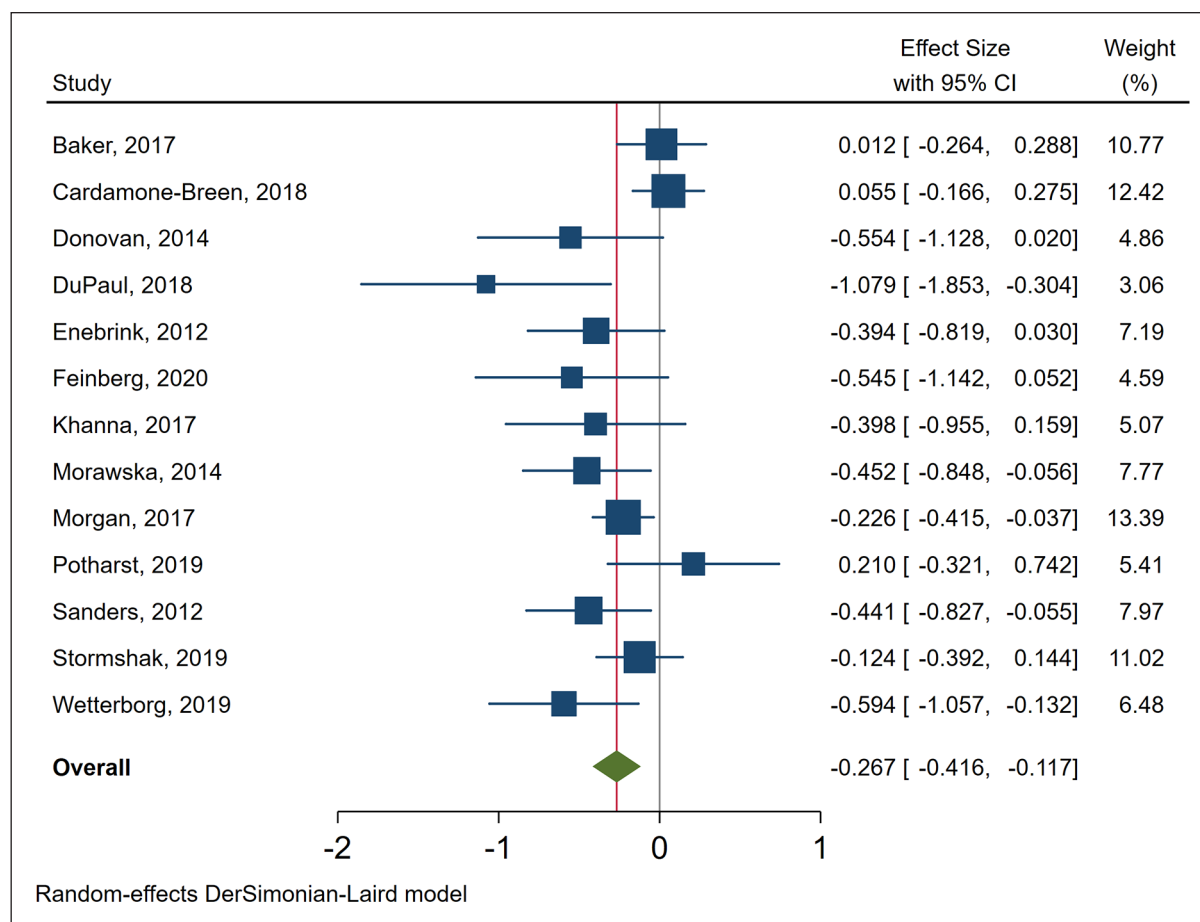


**Figure 3.** Forrest plot of online parental interventions compared to active control conditions for child emotional problems.

**Main results**

*Online parental interventions compared to wait-list (WL) control conditions at post-intervention.* Regarding the child and adolescent emotional problems outcome, at post-intervention, 13 RCTs were pooled, yielding an ES of  $g = -0.26$  (95% CI [-0.41, -0.11];  $p < .001$ ) favoring the online parental interventions, while the heterogeneity of ESs was moderate ( $I^2 = 52%$ ) (Figure 3).

For parental outcomes, the most reported outcome was parental distress, the pooling of 11 studies yielding an ES of  $g = -0.32$  (95% CI [-0.45, -0.18],  $p < .001$ ), in favor of the online parental interventions, with no apparent heterogeneity in ESs ( $I^2 = 0%$ ). For parental anxiety, six RCTs were pooled, revealing an ES of  $g = -0.20$  (95% CI [-0.36, -0.04],  $p = .012$ ) in favor of the online parental interventions, with no evidence for the heterogeneity of the ESs ( $I^2 = 0%$ ). For parental depression, seven RCTs were pooled,



**Figure 4.** Forrest plot of online parental interventions compared to wait-list control conditions for child emotional problems.

revealing an ES of  $g = -0.30$  (95% CI [-0.47, -0.12],  $p = .001$ ) in favor of the online parental interventions, while the heterogeneity of the ESs was low ( $I^2 = 16\%$ ).

**Online parental interventions compared to active control (AC) conditions at post-intervention.** For the child and adolescent emotional problems outcome at post-intervention, eight RCTs were pooled which compared online parental interventions to active control conditions, yielding a statistically non-significant ES of  $g = -0.07$  (95% CI [-0.17, 0.02];  $p = .131$ ) with no evidence for significant heterogeneity of the ESs ( $I^2 = 1\%$ ) (Figure 4).

In terms of parental distress, the pooling of six studies revealed a statistically non-significant ES of  $g = -0.10$  (95% CI [-0.22, 0.02],  $p = .118$ ), while heterogeneity in ESs was non-apparent ( $I^2 = 1\%$ ). For parental anxiety, four RCTs were pooled, revealing a statistically non-significant ES of  $g = 0.03$  (95% CI [-0.20, 0.27],  $p = .766$ ) while the heterogeneity of the ESs was moderate ( $I^2 = 53\%$ ). For parental depression, five RCTs were pooled, revealing a statistically non-significant ES of  $g = 0.03$  (95% CI [-0.14, 0.21],  $p = .699$ ), with low heterogeneity of the ESs ( $I^2 = 26\%$ ).

**Online parental interventions compared to all control conditions at follow-up.** Since there were too few RCTs that had follow-up measures for each of the contrasts between an online parental intervention versus wait-list or an online parental intervention versus active control on each outcome, we pooled the control conditions in order to be able to analyze if the efficacy of the parental interventions is maintained at follow-up.

Regarding the child/adolescent emotional problems outcome at follow-up, five RCTs were pooled, yielding an ES of  $g = -0.14$  (95% CI [-0.25, -0.02];  $p = .015$ ) in favor of the parental online interventions, with no evidence for heterogeneity of the ESs ( $I^2 = 0\%$ ).

For parental distress, the pooling of eight studies revealed an ES of  $g = -0.33$  (95% CI [-0.46, -0.20],  $p < .001$ ), in favor of the online parental interventions, while heterogeneity in ESs was low ( $I^2 = 20\%$ ). For parental anxiety, seven RCTs were pooled, revealing a statistically non-significant ES of  $g = -0.14$  (95% CI [-0.37, 0.08],  $p = .206$ ), with substantial heterogeneity ( $I^2 = 63\%$ ). For parental depression, seven RCTs were pooled, revealing a statistically non-significant ES of  $g = -0.18$  (95% CI [-0.38, 0.01],  $p = .069$ ), with moderate heterogeneity of ESs ( $I^2 = 54\%$ ).



## Sensitivity analyses

*Online parental interventions compared to all control conditions for child/adolescent emotional symptoms, child/adolescent anxiety symptoms, or child/adolescent depressive symptoms at post-intervention.* Since there were too few RCTs that reported separate data for child/adolescent emotional symptoms, child/adolescent anxiety symptoms, or child/adolescent depressive symptoms in each of the contrasts between an online parental intervention versus wait-list or an online parental intervention versus active control, we pooled all the control conditions, in order to determine the efficacy of online parental interventions on each of these discrete symptoms.

With regard to child and adolescent emotional symptoms, the pooling of 13 studies revealed an ES of  $g = -0.21$  (95% CI [-0.34, -0.08],  $p = .001$ ), in favor of the online parental interventions, while heterogeneity in ESs was moderate ( $I^2 = 44\%$ ). For child/adolescent anxiety symptoms, 10 RCTs were pooled, revealing a statistically significant ES of  $g = -0.12$  (95% CI [-0.25, -0.002],  $p = .046$ ), with moderate heterogeneity ( $I^2 = 44\%$ ). For child/adolescent depressive symptoms, two RCTs were pooled, revealing a statistically non-significant ES of  $g = -0.02$  (95% CI [-0.12, 0.17],  $p = .735$ ), with no heterogeneity of the ESs ( $I^2 = 0\%$ ).

*Online parental interventions compared to all control conditions, excluding studies in which the focus of the intervention is represented by behavior problems at post-intervention.* Control conditions were once again pooled together, since there were only 10 studies in which the focus of the intervention was other than behavior problems (i.e. internalizing problems and/or parental mental health). For child emotional problems, nine RCTs were pooled, yielding a statistically non-significant ES of  $g = -0.16$  (95% CI [-0.33, 0.000],  $p = .051$ ), with moderate heterogeneity ( $I^2 = 50\%$ ). With regard to parental distress, the pooling of two studies revealed a statistically significant ES of  $g = -0.48$  (95% CI [-0.90, -0.07],  $p = .021$ ), with no heterogeneity ( $I^2 = 0\%$ ). For parental anxiety and parental depression there were not enough studies to derive an ES (i.e. 0 and 1 study, respectively).

## Subgroup analyses

*Clinical status of the children as a moderator in online parental interventions compared to all control conditions for child emotional problems.* We ran a subgroup analysis to investigate if the clinical status of the children in studies where child emotional problems were reported was a significant moderator. Once again, the control conditions were pooled together, given that there were too few studies in each of the separate comparisons between parental interventions versus waitlist or parental interventions versus active care. There were 10 studies in which the children had clinical status at study inclusion, 5 studies in which the children had non-clinical status and 6 studies in which the sample of children was a mixture of both clinical and non-clinical

samples. The clinical status was not a statistically significant moderator,  $Q(2) = 4.63$ ,  $p = .098$ , with moderate evidence for heterogeneity,  $I^2 = 40\%$ .

*The type of control group as a moderator in online parental interventions compared to all control conditions for child emotional problems.* We ran a subgroup analysis to investigate if the type of control group that was used in the primary studies where child emotional problems were reported is a statistically significant moderator of the ES. As evidenced in the main results, there were 13 primary studies which employed WL as a control group, while 8 studies employed an AC condition. The type of control group was a significant moderator,  $Q(1) = 4.34$ ,  $p = .037$ . Mirroring the main results, while in the case of studies employing WL the ES was statistically significant ( $g = -0.26$  (95% CI [-0.41, -0.11],  $p < .001$ ), in the case of studies employing AC the ES was statistically non-significant ( $g = -0.07$  (95% CI [-0.17, -0.02],  $p = .131$ ), with moderate evidence for heterogeneity,  $I^2 = 40\%$ .

*Meta-regression analyses.* The number of sessions was a statistically significant moderator in the contrast between online parental interventions and wait-list, in terms of the child emotional problems outcome at post-intervention (slope = -0.05, 95% CI [-0.08, -0.02],  $p = .001$ ), showing that an increase in the number of sessions is associated with an increase of the ES in favor of the parental online interventions for this outcome. Moreover, the proportion of total between-study variance that was explained by this meta-regression model was 79.34%. This moderator did not attain statistical significance for parental distress, parental anxiety symptoms, or parental depressive symptoms in this contrast; furthermore, we observed no moderation effect for the number of sessions in the contrast between an online parental intervention and active controls at post-intervention.

The mean age of the children/adolescents was a significant moderator only for the contrast between online parental interventions and active controls, regarding the parental anxiety symptoms (slope = 0.15, 95% CI [0.03, 0.27],  $p = .013$ ), meaning that a lower mean age of the child is associated with an increase of the ES in favor of the online parent intervention for this outcome. The proportion of total between-study variance that was explained by this meta-regression model was 100%. This moderator did not attain statistical significance for child emotional problems, parental distress, or parental depressive symptoms; furthermore, we observed no moderation effect in the contrast between an online parental intervention and wait-list at post-intervention.

The RoB score did not have any moderating effect, regardless of the contrast between the intervention or the selected outcome.

## Small study effects and publication bias

Visual inspections of the funnel plots and the Duval and Tweedie trim and fill analysis revealed that, for the online parental interventions versus wait-list control conditions with regard to child/adolescent emotional problems there

was no need for adjustment on potential missing studies. For the online parental interventions versus active control conditions with regard to child/adolescent emotional problems, similarly, there was no need for adjustment on potential missing studies.

## Discussion

In this study, we aimed to determine the efficacy of online parenting interventions that target emotional symptoms in children and adolescents, by analyzing the studies which investigated them. Our results showed that online parenting interventions bring immediate significant low-level improvements in children and adolescent emotional symptoms, compared to wait-list or to all pooled control conditions. No significant separate effects were delineated in terms of improvements in youth anxiety or depression symptoms. At follow-up, the improvements in children and adolescent emotional symptoms, albeit low, remain significant compared to all pooled control conditions. Our findings regarding child emotional symptoms are in line with other meta-analyses that performed secondary analyses on this outcome and obtained similar results (see Thongseiratch et al., 2020), showing lower improvements compared to behavior outcomes. This result might be related to the fact that many of the programs did not focus explicitly on child and adolescent emotional symptoms, but on child behavior problems or focused on parent mental health (20 out of 30 studies). However, our findings regarding the maintenance of the improvements following the online parenting programs in terms of child emotional symptoms at the same level at follow-up are promising. Moreover, the significant improvements in child emotional problems at follow-up compared to all pooled conditions is a promising result given the fact that traditional face to face parenting programs were also considered active controls in this study (four out of the five studies employed active controls at follow-up).

In terms of parent outcomes, our results show that online parenting interventions bring significant low-level improvements in parental distress and parent mental health (i.e. depression and anxiety symptoms), which are maintained at the same level at follow-up. These results are in line with findings from previous meta-analyses that focused on the effects of online parent programs of child and adolescent behavior outcomes (see Baumel et al., 2016; Florean et al., 2020), or more generally on psychological and physical health (see Flujas-Contreras et al., 2019). These findings are important given the fact that most parent programs included do not target specifically the mental health of parents, and thus it is possible that this effect is obtained from applying the techniques meant to support the emotional health of their children. Another possibility is that the mental health of parents is improved once improvements in children and adolescents emotional

and behavioral symptoms arise. Thus, future studies will need to also measure mechanisms of change for the parent programs, in terms of the improvements in youth and parent emotional symptoms outcomes, to better focus on the key mechanisms that can increase their efficacy.

Our moderation analyses suggest that longer online parent programs are more effective in improving child emotional problems, when compared with waitlist immediately after the intervention. Additionally, we have found that higher improvements are obtained following the online parent interventions in terms of parent anxiety, when targeting parents of younger children. These findings are important since they suggest that systematic training of parenting emotional support skills is needed early on to produce more consistent improvements in both children and parent emotional problems. Moreover, since we did not obtain significant moderation effect in terms of the clinical status of the children, this result suggests that parenting interventions can be equally effective for both clinical and non-clinical levels of emotional problems.

## Limits

An important limitation of the present study is that many of the studies included did not include specific measures for anxiety and depression symptoms in children and adolescents and this did not allow for conducting analyses on specific outcomes for the contrast between online parental intervention and wait-list at posttest. Moreover, most of the studies did not include follow-up measures, and thus we were not able to include enough studies to analyze specific changes. Also, considering the relatively low number of effect sizes for each comparison and the multitude of outcomes that were considered, the risk for type I errors is relatively high and results should be considered with caution. Another important limitation is that there are few studies that investigated parenting interventions designed to address specifically the emotional symptoms of children and adolescents and only one was delivered on mobile devices. Also, most of the parental interventions were self-directed (in 22 out of the 30 studies) and did not offer participant-tailored content and/or feedback, and this is an important limitation given that these are important components that are associated with improved outcomes in online therapeutic interventions. Another limitation is related to the small number of studies that compare online parent interventions with face to face parent interventions (only four that included mostly equivalence designs), which prompted us to combine these with other active interventions as comparator category. However, since face to face parent interventions are known to be effective for various child outcomes, future studies will need to investigate their separate efficacy in comparison to online parent interventions. Also, future studies need to investigate online parent interventions with dedicated content that can support the development of parent skills in

relation to child emotional symptoms (e.g. emotion coaching; MacKinnon et al., 2022).

## Conclusions

Results of our meta-analyses suggest promising and sustained effects of online parenting programs on both child and parent emotional outcomes. Our results are promising given the high prevalence of emotional disorders in youths and their long term persistence. Future research will need to investigate the long-term efficacy of the programs that focus primarily on the emotional symptoms of children and adolescents and that can personalize the contents (e.g. length or number of session) based on the needs of the families (e.g. type of the symptoms and age).

## Author contributions

OA David supervised through the course of the article and designed the protocol with LA Fodor. LA Fodor conducted the literature search, created the database, and assigned articles to be reviewed by MD Dascăl and IS Miron. OA David and LA Fodor ran the statistical analyses and wrote the article. All authors approved the final manuscript.

## Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by two grants awarded to Oana A. David from the Romanian National Authority for Scientific Research, CNCS – UEFISCDI [grant numbers PN-II-PT-PCCA2013-4-1937 and PN-III-P2-2.1-PED-2019-3837]. The funding institution had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

## Ethical approval

An ethics statement is not applicable because this study is based exclusively on published literature. Ethical approval and consent were not required as this study was based on publicly available data. Patient consent were not required as this study was based on publicly available data.

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## Data availability statement

All data generated or analyzed during this study are included in this article. Further enquiries can be directed to the corresponding author.

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