



Effectiveness of Remotely Delivered Parenting Programs on Caregiver-child Interaction and Child Development: a Systematic Review

Katherine Solís-Cordero¹ · Luciane Simões Duarte² · Elizabeth Fujimori¹

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Abstract

Remotely delivered parenting interventions are suitable to promote child well-being and development, in a context of social isolation, as our society faced due to COVID-19. The objective of this systematic review was to assess the effectiveness of remotely delivered parenting interventions for typically developing children on caregiver-child interaction and child development. We carried out a systematic search to find studies from the inception of the database to September 2021 on six electronic databases: MEDLINE, CINAHL, Embase, Scopus, Web of Science Core Collection and Regional Portal Information and Knowledge for Health (BVS), and gray literature. Eligible study designs were experimental and quasi-experimental studies. We included parenting interventions as long as they were remotely delivered and focused on typically developing children. Two outcomes were considered: caregiver-child interaction and child development. Three randomized controlled trials (RCT) and one quasi-experimental study met the inclusion criteria. Results from two RCT revealed positive, small-to-medium effects on child development. One study showed that the new intervention had a not inferior effect compared to the results achieved by the traditional support. Children who participated in the quasi-experimental study showed significant elevations in language ability. One study reported positive caregiver-child interaction results. There is insufficient evidence to draw definitive conclusions regarding the effectiveness of remotely delivered parenting interventions on child development due to the heterogeneity of participant profiles, mode of delivery, and assessment tools. The results suggest the need to develop future methodologically rigorous studies assessing the effectiveness of remotely delivered parenting interventions for typically developing children on caregiver-child interaction and child development.

Keywords Child development · Parent-child interaction · Remotely delivered · COVID-19 virus · Systematic review

Highlights

- Families need support and motivation to promote the well-being and development of their children.
- Remotely delivered parenting interventions for typically developing children are suitable in a context of social isolation.
- There are limited randomized control trials which assess the effectiveness of remotely delivered parenting interventions for typically developing children.

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✉ Katherine Solís-Cordero
katherine.soliscordero@ucr.ac.cr

¹ School of Nursing, University of São Paulo, São Paulo, Brazil

² Chronic Non-communicable Diseases Division, Disease Control Coordination, São Paulo State Health Department, São Paulo, Brazil

It is well-known that the first years of life are crucial for child development and health, and the impact of experiences lived during early years can remain over a lifetime (Bick & Nelson, 2017; Fox et al., 2010; Shonkoff & Phillips, 2000). Nonetheless, a significant number of children in low- and middle-income countries, are at risk of not achieving cognitive, language, and socio-emotional skills in their early years of life (Lu et al., 2016; McCoy et al., 2016). Poverty-related risk factors can negatively interfere with the quality of caregiver-child interaction and stimulation of children at home which is associated with poor early child development outcomes of

typically developing children (Black et al., 2017; Grantham-McGregor et al., 2007; Shonkoff & Phillips, 2000).

Evidence shows that families, especially those in vulnerable conditions, need support and motivation to promote the well-being and development of their children (Britto et al., 2017; Rayce et al., 2017; WHO, 1997). In this context, the 2017 Series on Advancing Early Childhood Development in The Lancet called for early child development programs to be integrated into government health services for large-scale implementation, with the aim of reaching the greatest number of children at risk of not achieving their developmental potential (Britto et al., 2017).

Parenting interventions were implemented considering that by improving caregiver-child interaction, it may positively influence child development (Attanasio et al., 2014; Teepe et al., 2017; Weisleder et al., 2018; Yousafzai et al., 2015). Previous systematic reviews and meta-analyses have confirmed positive effects of parenting programs on both caregiver-child interaction and child development (Britto et al., 2015; Jeong et al., 2021; Rayce et al., 2017). However, these interventions were delivered mainly through face-to-face modalities.

We have just experienced a situation of social isolation due to the pandemic caused by the coronavirus disease (COVID-19), which made it impossible to implement face-to-face interventions, and has been documented as a risk factor for the child development of typically developing children (Center on the Developing Child, 2020; Cluver et al., 2020; UNICEF, 2020). Thus, we conducted this systematic review to address the gaps in the knowledge about remotely delivered parenting interventions to improve both the caregiver-child interaction and early development outcomes of typically developing children. Interventions of interest were those aimed at typically developing children, those who did not have behavioral or other diagnosed problems that already place them at risk of child development delays.

A preliminary search of different databases did not identify systematic reviews that have specifically examined the effectiveness of remotely delivered parenting interventions for typically developing children.

Therefore, the objective of this review was to assess the effectiveness of remotely delivered parenting interventions for typically developing children on caregiver-child interaction and child development. The review question was: what is the effectiveness of remotely delivered parenting programs for typically developing children on caregiver-child interaction and child development when compared to usual care or no intervention?

Method

We performed a systematic review according to the guidelines of The Joanna Briggs Institute (Tufanaru et al., 2017)

and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Page et al., 2021).

Search Strategy

The search strategy aimed to find both published peer-reviewed articles and gray literature from the inception of the database to September 2021. An initial limited search was performed on MEDLINE and CINAHL to analyze the text words contained in the title and abstract and in the index terms used to describe the articles. This information helped in the development of a search strategy, which was adapted to tailored for each information source. Other databases were searched including Embase, Scopus, Web of Science Core Collection, and Regional Portal Information and Knowledge for Health (BVS). The search for unpublished studies included Open Grey literature: Google Scholar, Science Direct, DART-Europe E-theses Portal, Biblioteca Digital Brasileira de Teses e Dissertações (BDTD), Theses Canada Portal, and Library and Archives Canada. Key terms searched included childhood terms (infant/child/children), parenting intervention (intervention/training/program/parenting/positive parenting practices), caregiver-child interaction (parent-child relations/parent-child interaction) and child development (cognitive development/cognition/ executive function/language development/communication/motor development/gross motor/fine motor/socioemotional development/socio-emotional and emotional) (Supplementary material. Table 1). The English language was used in the search strategy, as well as singular and plural expressions. Truncation and proximity operators were employed to increase the accuracy of the search.

Inclusion Criteria

Participants

The review included studies on interventions aimed at caregiver-child dyads. Caregiver was defined as any adult person biologically or not related to the child, who lives with daily, and who has the responsibility of caring, stimulating, loving, educating, and with whom the child forms the strongest emotional bonds in the first years of life (WHO, 2004). Children under 36 months of age at the time of the intervention, as it is well-known that the first three years of life are a critical period for child development and long-term health (Center on the Developing Child, 2010). In addition, the participants must be typically developing children.

Intervention

This review included studies that evaluated parenting interventions, which are defined as interventions or services

aimed to improving parenting interactions, behaviors, knowledge, beliefs, attitudes, and practices to improve child health and development (Britto et al., 2017), that was remotely delivered through any remote option such as phone, email, mail, online parenting groups, radio, and TV; they could not be face-to-face programs, i.e., the professional could not be present at the moment of the intervention, and that were specifically focused on typically developing children (i.e., children without developmental delays, diagnosed conditions, behavioral problems or other problems). There was no restriction regarding the content, length, and/or frequency of the intervention.

Comparators

This review considered studies that compared the intervention to the usual care or no intervention or another intervention not remotely delivered.

Outcomes

This review considered two outcomes: caregiver-child interaction and child development. Caregiver-child interactions are determined by both, external conditions (environmental and social factors), and by internal parental motivations (sensitivity, responsiveness, language and cognitive stimulation, positive regard/warmth, behavior guidance), and infant capacity (very low birth weight, neurological difficulties, immature neurophysiological systems) (WHO, 2004). In general, caregiver-child interaction provides children's physical needs and protects them from harm, thus, with their basic needs provided, children can turn their attention towards learning about the important features of their world (WHO, 2004). Considering the complexity of this concept and the variety of comprehension and tools to assess caregiver-child interaction, this review included studies that distinctly mentioned the expression "interaction" in their methods, including mother or parent, and all the different forms to assess the interaction.

Child development is a maturational and interactive process of change, that begins at the conception and in which the child acquires increasingly complex motor, cognitive, language and psychosocial functions. Furthermore, it depends on the interaction between genetics and environment (Black et al., 2017; Engle et al., 2007). This definition incorporates the three main domains into which child development has been divided in: physical, cognitive and psychosocial. The physical domain corresponds to the physical and brain growth, taking into consideration sensory abilities and motor skills. The cognitive development refers to mental skills such as thinking, memory, reasoning, learning, and language. Finally, the psychosocial domain is related to emotions, personality, and social relationships

(Papalia et al., 2006). The three domains are interrelated, making the development to be multidimensional and multidirectional. In the literature, child development assessment includes a variety of tools to evaluate all domains or one in particular. Therefore, this review included all available tools.

Types of Studies

For the search strategy, we considered both experimental and quasi-experimental study designs, such as randomized controlled trials, non-randomized controlled trials, before and after studies, and interrupted time-series studies. Studies published in English, Portuguese and Spanish were included.

Exclusion Criteria

This review excluded:

- Studies including children with specific characteristics such as: preterm birth, commonly defined as birth before 37 weeks of gestation; autism; victims of any type of violence; presence of illness at study time; behavioral problems, as aggressiveness; and presence of special needs;
- Studies including parents with physical and mental illness;
- Studies limited to adolescent parents or that did not distinguish this group in the statistical analyses;
- Studies related to protocol of randomized clinical trials.

We decided to exclude studies including children with special needs or diagnosed conditions because these children require more targeted supports and outcomes among these children may not be generalizable to the general population.

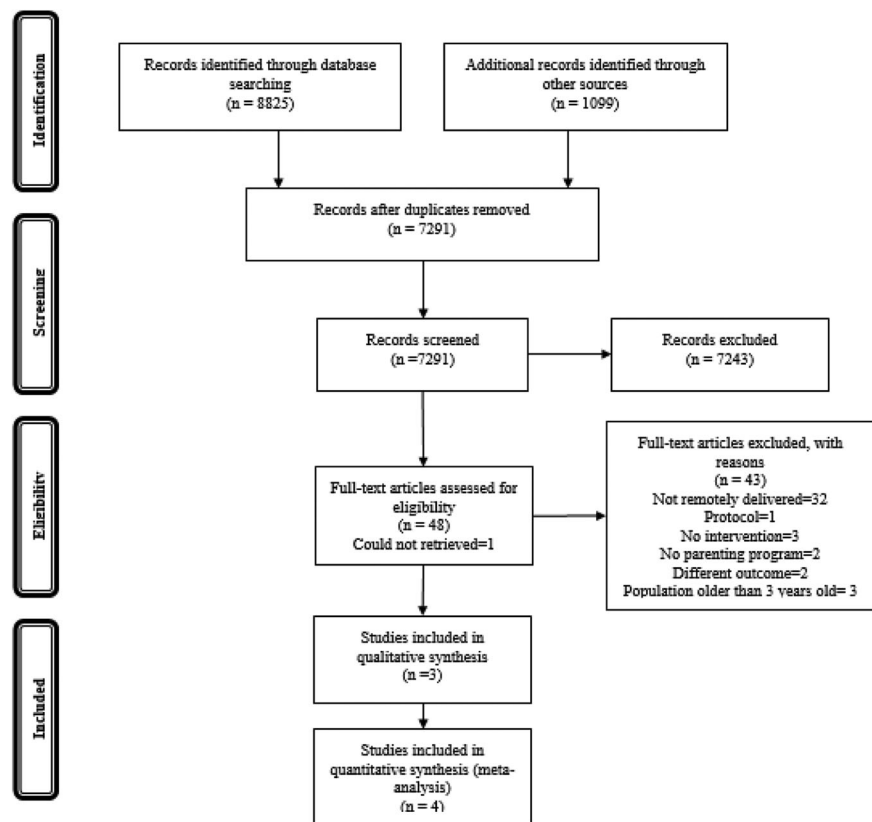
Study Selection

All identified citations were uploaded into Mendeley (Mendeley Ltd, Elsevier, The Netherlands) and duplicates were removed. Studies were selected by screening titles and abstracts according to inclusion criteria, and assessed by two independent reviewers (KSC and LSD). Then, the full text of potentially relevant studies was retrieved and assessed according to the inclusion criteria. The reasons for the exclusion of full-text studies were presented in a PRISMA flow diagram. No disagreements arose between the reviewers; therefore, a third reviewer was not required.

Assessment of the Methodological Quality

The selected studies were critically appraised by two independent reviewers (KSC and LSD), using standardized critical appraisal instruments from the Joanna Briggs Institute (JBI), specific to the study design. These critical

Fig. 1 PRISMA Flow Chart.
Source: Elaborated by the authors



appraisal instruments have been developed and approved by JBI Scientific Committee following extensive peer review (Tufanaru et al., 2017). Any disagreements were resolved through consensus without consulting a third reviewer. All studies that were critically appraised were included for data extraction and synthesis (Supplementary material. Table 2).

Data Extraction and Data Synthesis

Data regarding specific details were extracted by the authors: study characteristics (including authors, country where the study was conducted, year of the publication, study design, participants), the mode that the parenting intervention was delivered, effectiveness on the caregiver-child interaction, and child development. Due to the heterogeneity of measures of caregiver-child interaction and child development, a meta-analysis could not be performed. The results are therefore presented as a narrative.

Results

Description of the Studies

The results of the search are presented in the PRISMA flow diagram (Fig. 1). A total of 8825 articles were retrieved

from the selected databases. Additional records identified through other sources included 1099 studies. After removing the duplicates, 7291 remained. Among these, 7243 were excluded after screening the titles and abstracts. Thus, 48 studies were evaluated for full-text eligibility; however, one study could not be retrieved, although it did not mention whether it assessed a remotely delivered parenting intervention. From the 47 articles that advanced to the full review phase, 43 did not meet the inclusion criteria (Supplementary material. Table 3). Therefore, four articles (Abimpaye et al., 2019; Feil et al., 2020; Gilkerson et al., 2017; Sawyer et al., 2017), representing four unique interventions for typically developing children, were assessed for methodological quality and subsequently included in this review.

Characteristics of the Included Studies

Table 1 describes the characteristics of the studies included in this review. Three included studies were randomized controlled trials and one was a quasi-experimental study. All of them assessed different modes of remotely delivered parenting interventions for typically developing children. Two studies compared the remotely delivered intervention with a control group that received usual care (Sawyer et al., 2017) or no intervention (Gilkerson et al., 2017). One study

Table 1 Summary of the randomized controlled trials included in the present study

Author, year, country	Study design	Population		Primary caregiver	Child age (months)	Specific characteristics	Outcomes relevant to review (Assessment used)	
		Size	Intervention and control				Adult-child interaction	Child development
Abimpaye et al. (2019), Rwanda	Cluster randomized controlled trial	1450 participants: 485 light touch, 486 full intervention, 479 control		Mothers, fathers, others	6–36	No: all parents with a child aged 6–24 months were recruited	Not assessed	Child development (ASQ)
Feil et al. (2020), USA	Randomized controlled trial	159 dyads: 83 experimental, 76 attention control program		Mothers	3.5–7.5	Yes: participants to be at or below 130% of the federal poverty guidelines	Mother-infant observed behavior (The Landry Parent–Child Interaction Scales)	Not assessed
Gilkerson et al. (2017), USA	Quasi-experimental	72 families: 35 immediate-treatment 37 delayed treatment		Parents	9–21	No: participants were recruited via a website	Not assessed	Language development (MB-CDI, Developmental Snapshot and the Child Development Inventory)
Sawyer et al. (2017), Australia	Randomized control trial	794 mothers were assigned either on the basis of their preference to: 128 intervention 183 control. In addition, others were randomly assigned to: 233 intervention 250 control		Mothers	1–7	No: all new mother in birthing hospitals in South Australia were recruited.	Not assessed	Children's socioemotional development (ASQ-SE) and children's verbal development (MCDI-SF)

ASQ Ages and Stages Questionnaires, ASQ-SE Ages and Stages Questionnaire–Social-Emotional, MB-CDI MacArthur–Bates Communicative Development Inventory, MCDI-SF MacArthur Communicative Development Inventory Short Forms. Source: Elaborated by the authors

compared the remotely delivered program with another intervention (Feil et al., 2020). One study compared the remotely delivered program with another intervention, as well as with the usual care (Abimpaye et al. 2019). The studies were carried out in three different countries Rwanda (Abimpaye et al., 2019), Australia (Sawyer et al., 2017), and United States of America (Feil et al. 2020; Gilkerson et al., 2017). All studies were published in English. It is worth mentioning that one of the randomized controlled trials assessed the non-inferiority outcomes of parenting program (Sawyer et al., 2017): the authors reported that the results of parenting intervention (clinic-based postnatal health check plus Internet-based support) were not inferior compared to the home-based support program.

Participant characteristics

A total of 2475 caregiver-child dyads from the four studies were considered in this review. Sample sizes ranged from 72 to 1450 dyads. Two studies were exclusively delivered to mothers (Feil et al., 2020; Sawyer et al., 2017), and two were addressed to the principal caregiver (mother, father, or other) (Abimpaye et al., 2019; Gilkerson et al., 2017). Three studies recruited families without specific characteristics (Abimpaye et al., 2019; Gilkerson et al., 2017; Sawyer et al., 2017) and one recruited mother-infant dyads from households at or below 130% of the federal poverty guideline (Feil et al., 2020). All four studies comprised children postnatally, from newborn to 36 months old (Table 1).

Interventions

Tables 2 and 3 present the intervention details. All four interventions focused on promoting parenting skills and improving developmentally appropriate learning opportunities for children through talking and playing. Additionally, Sawyer et al. (2017) included some topics related to child health. Considering that all four interventions were remotely delivered, there were different modes of delivery: radio (Abimpaye et al., 2019) and internet (Feil et al., 2020; Gilkerson et al., 2017; Sawyer et al., 2017). Furthermore, the intervention that used radio and one that used internet, were complemented with face-to-face support, such as home visits (Abimpaye et al., 2019) and clinic-based health check (Sawyer et al., 2017). The other two interventions were completely remotely delivered (Feil et al., 2020; Gilkerson et al. 2017) (Table 2). One intervention was delivered by trained local volunteers (Abimpaye et al., 2019), two interventions were delivered by a language development expert and trained staff members (Feil et al., 2020; Gilkerson et al., 2017), one intervention moderated by nurses (Sawyer et al., 2017). The duration of the four

interventions was short term (≤ 6 months). The intensity of the interventions varied from access when needed (Sawyer et al., 2017) to a monthly delivery (Abimpaye et al., 2019).

Outcomes

Three studies reported child development outcomes (Abimpaye et al., 2019; Gilkerson et al., 2017; Sawyer et al., 2017). One of the studies reported caregiver-child interaction results (Feil et al., 2020). (Table 1). The four studies presented post-test and follow-up results. One study reported long-term outcomes (Sawyer et al., 2017) (Table 3).

In general, the interventions showed satisfactory results in child development; and all studies confirmed their hypothesis, intervention groups showed better results than control groups, with small to medium effect sizes. However, the study by Gilkerson et al. (2017) did not report its results on language development, separately for the intervention and the control groups. Instead, the authors combined results at 12 months of both groups after receiving the intervention, which makes it difficult to confirm that the improvement in language development is specifically due to the intervention.

The trial comparing exclusively remotely delivered parenting intervention versus remotely delivered parenting intervention complemented with face-to-face support found a smaller effect size of the exclusively remotely delivered intervention (Abimpaye et al., 2019) (Table 3). However, the variation of participant profiles, mode of delivery, assessment tools, measurement times, as well as data treatment, make it difficult to do the comparative analysis of the results from the three studies.

Discussion

We aimed to assess the effectiveness of remotely delivered parenting interventions for typically developing children on caregiver-child interaction and child development. We identified and assessed three randomized controlled trials and one quasi-experimental study of remotely delivered parenting interventions for typically developing children that were carried out to enhance child development. Due to the aforementioned limitations of the study by Gilkerson et al. (2017) we will focus the discussion of the results on the other three interventions. Two studies showed small effect sizes of the remotely delivered interventions on socioemotional development (Abimpaye et al., 2019; Sawyer et al., 2017). The only study that reported caregiver-child interaction as an outcome showed positive effect of the intervention on mothers' language supportive parenting behavior component which is a component of caregiver-

Table 2 Parenting Intervention Characteristics

Author, year	Name of the intervention	Description of the intervention	Mode of delivery	Responsible of delivery	Begins	Intensity	Ends/ Duration	Posttest/ Follow up	Comparison
Abimpaye et al. (2019)	First Steps Parenting Education	To assist all parents in promoting language development and emergent literacy at home through simple activities such as talking, singing, and storytelling and creating a print-rich environment in the home.	Light touch: Group sessions through participatory radio programming (a highly accessible and cost-effective technology in the Rwandan context).	Local volunteer who received three half-day trainings	Post natal	1.5-hour long intervention once a week	Duration: 17 weeks	Posttest: 5 months after the end of the active implementation of the intervention / Follow up: A year later	Full touch group: received the radio show, parenting sessions and home visits. Control group: received no intervention at all.
Feil et al. (2020)	Play and Learning Strategies program (ePALS)	A bilingual English–Spanish internet adaptation of the PALS; a preventive intervention program to strengthen effective parenting practices that promote early language, cognitive, and social development.	Internet	Coaches held at a minimum a bachelor's degree in a helping profession such as counseling, psychology, social work, or early childhood education that completed a two-day training	Post natal	Coach call to co-view weekly videos with mothers	Duration: 11 sessions	Posttest: six months after pre-assessment	Attention-control condition: received the same learning component structure as in experimental condition except using PALS concepts and engaging in any parenting skill instruction or coaching during call.
Gilkerson et al. (2017)	Language Environment Analysis (LENA) and online parent training intervention	LENA-based feedback reports for parents regarding their home language environments, online educational materials providing information to parents on improving their child's language environment, and ad hoc coaching support by a trained staff member delivered online or by phone for increasing talk and interaction in the home.	Internet-based intervention: webinars, parent forum, talking tips videos, and other educational materials.	Language development expert and a trained staff member.	Post natal	Daily LENA reports. Six live webinars during the 3-month treatment period. Parent discussion forum and talking tips videos once a week. A minimum of one phone coaching session.	Duration: 3 months	Posttest: 3 months after the treatment period/ Follow up: at 3-month intervals until study completion.	Delayed-treatment (control) group that received the intervention 3 months later.
Sawyer et al. (2017)	Internet-based group intervention	The internet group consisted of a mother online group, following	Individual session + nurse-moderated	Nurses who had completed a 3-day training	Post natal	Access when needed	Duration: 6 months	Posttest: at 9 months / Follow up: at 15 months and 21 months	Control group: received the usual care (postnatal

Table 2 (continued)

Author, year	Name of the intervention	Description of the intervention	Mode of delivery	Responsible of delivery	Begins	Intensity	Ends/ Duration	Posttest/ Follow up	Comparison
		a curriculum that addressed 11 major thematic areas relevant to mothers and babies (for example, sleeping, breastfeeding and baby development). However, the chronological order in which the topic material was presented to the groups on the chat page was flexible and could vary according to the nature of the discussions between the mothers.	Internet-based group						home-based support provided by a community nurse).

Source: Elaborated by the authors

child interaction (Feil et al., 2020). It is not feasible to provide strong evidence on the effectiveness of remotely delivered parenting interventions for typically developing children on caregiver-child interaction and child development due to the low number of studies and the heterogeneity of the interventions.

The researchers of the four studies meeting the inclusion criteria, used two different resources to remotely delivering the interventions such as: radio and Internet. This diversity of modes of delivering the parenting interventions may result from the context and characteristics of the people receiving the intervention. In the case of the First Steps Project, in the context of Rwanda, the radio is a highly-accessible and cost-effective technology that allows to reach a larger number of families. Additionally, radio has the advantage that it allows to deliver the content of the intervention in a format that is effective in low-literate contexts. These characteristics of the use of radio make it a useful resource to deliver parenting interventions in other low-and middle-income countries. Notwithstanding, radio has the limitation of hindering two-way communication between families and providers which could require another face-to-face intervention to complement the program. In Australia and United States, as well as in other high-income countries, the use of the Internet to provide health care and support have increased significantly. Compared to radio, the Internet allows two-way, real-time communication between participants and providers, however, socioeconomically disadvantaged families with no access to Internet or families who do not have digital skills could not benefit from the intervention.

Remotely delivered parenting interventions for typically developing children seems to be an effective mode of delivery compared to the usual care or no intervention. Remotely delivered parenting interventions showed positive results, which suggests that remotely-supported interventions can guide families through the challenges of caring for their children. Like that reliable say states that doing will always be better than not doing, regarding child development of typically developing children, not doing has a high cost in opportunities and equity for children, families and society (Richter et al., 2017). Furthermore, considering the conditions in which health or social systems cannot guarantee face-to-face programs, it is important to have early childhood interventions that can be remotely delivered. Nonetheless, when compared to other intervention which included face-to-face support, the effect size tended to be smaller (Abimpaye et al., 2019; Sawyer et al., 2017). We believe that the face-to-face contact may have better results because it promotes higher motivation and engagement of the families (Burrell et al., 2018). Moreover, interventions that used two modes of delivery may have better results, since an extensive review has consistently shown that those who used more than one modality obtained better results than those who used only one

Table 3 Parenting intervention main findings

Author, year	Main findings
Abimpaye et al. (2019)	Children in the light touch showed better results in the ASQ benchmarks than the control group in all developmental domains. Effect size differences compared to control group showed small to medium effect size of the light touch arm in all developmental domains (communication = 0.38, gross motor = 0.58, fine motor = 0.32, problem solving = 0.38 and personal-social = 0.35). Comparing the two intervention groups, the children in the light touch group were significantly more likely to meet the gross motor benchmark than children in the full intervention group (light touch = 0.58 vs full intervention = 0.24).
Feil et al. (2020)	ePALS strengthened mothers' language-supportive parenting behavior toward her infant during the book share activity. Significant correlation between residualized posttests scores for maternal language-supportive behaviors and infant language behaviors for mothers and infants in the experimental ePALS condition.
Gilkerson et al., (2017)	Little change was observed for the MB-CDI standardized vocabulary score, while the expressive language development quotient from the Child Development Inventory and the Snapshot showed an increase from baseline for the aggregate sample and for families whose conversational turns scores at baseline were above the 50 th percentile. (No effect sizes were reported by the authors).
Sawyer et al. (2017)	Children randomly assigned to clinic + Internet group reported non-inferiority results in all ASQ-SE scores, at each follow-up assessment (9 months = 0.73; 95%CI = 0.15 to 1.31; 15 months = 0.40; 95%CI = −0.18 to 0.98; 21 months = 1.27; 95%CI = 0.69 to 1.85). However, the MCDI-SF did not achieve non-inferiority, the adjusted mean scores (−4.79; 95% CI = −5.66 to −3.92) with the lower 95% CI extending beyond the non-inferiority cut-off of −5.30.

ASQ Ages and Stages Questionnaires, ASQ-SE Ages and Stages Questionnaire–Social-Emotional, MB-CDI MacArthur–Bates Communicative Development Inventory, MCDI-SF MacArthur Communicative Development Inventory Short Form

Source: Elaborated by the authors

modality (Britto et al., 2015). The emergence of new and different modes of delivering parenting interventions do not intent to replace traditional modes of face-to-face delivered programs, which already have strong evidence, and clinical, social, and political support (Sawyer et al., 2017). In this regard, remotely delivered parenting interventions represent good options to complement face-to-face interventions and to ensure that all children and their families benefit from initiatives that seek to develop parenting skills and to improve early childhood outcomes. For example, the different and complex situation due to the COVID-19 crisis that enforced measures as staying at home and social distancing.

Despite the existence of numerous systematic reviews and meta-analyses that evidenced the effectiveness of parenting interventions for typically developing children on caregiver-child interactions and child development (Britto et al., 2015; Eshel et al., 2006; Jeong et al., 2018; Shah et al., 2016), none of these evaluated exclusively the effects of remotely delivered parenting interventions. The findings of this systematic review are similar to those of previous reviews and meta-analyses that showed modest benefits of parenting interventions. A systematic review and meta-analysis of 21 interventions, involving parents in psychosocial stimulation to promote child development, revealed that stimulation had a medium effect size of 0.42 and 0.47 on cognitive and language development, respectively (Aboud and Yousafzai 2015). Meta-analysis assessing interventions for families with children at risk of developmental harm found a high effect size for parent-child interaction, whereas the effects on cognitive development were either small or not significant (Rayce et al., 2017). Meta-

analysis including 15 studies evaluating stimulation interventions reported medium effect size in improving mother-child interactions (Jeong et al., 2018). Therefore, it appears that regardless of whether the intervention is face-to-face or remotely delivered, achieving a large effect of the parenting interventions for typically developing children remains a challenge for researchers and stakeholders.

Currently, it is expected that there will be an increase in the number of remotely delivered parenting interventions aimed at typically developing children. Early childhood development services must respond to the demands that parents have about caring for their children. For all professionals and disciplines working with children, it is necessary to reinvent childcare services with the aim to guarantee the children's safety and their developmental potential. Isolation should not be a reason to leave families without support. Therefore, remotely delivered parenting interventions allow the continuity of childcare services that aim to promote child development and can reduce the negative impact of the current situation due to COVID-19 or other infectious diseases. The above-mentioned non-traditional initiatives, which were effective in improving child development, are excellent ideas to develop parenting interventions to support, educate and motivate families to provide a nurturing and safe environment, especially in the early years of life.

Strengths and Limitations

We identified some strengths in this systematic review. In relation to the methodological appraisal, the four studies

were well-designed randomized controlled trials. They demonstrated a low risk of bias, examining a large sample size and with appropriate statistical analysis including adjusted variables. The most affected items were blindness of participants and providers, which is justifiable for educational intervention trials.

This systematic review also has some limitations. Despite the comprehensive search across all databases, some eligible studies may have been missed. The review only included studies in English, Portuguese and Spanish, so additional studies written in other languages may have been excluded. The small number of included studies and the heterogeneous nature of interventions, outcomes, and settings represents a limitation. Furthermore, our findings may not be generalizable to children with special needs such as developmental delays, diagnosed conditions or behavioral problems.

Implications for Practice

A systematic review of randomized controlled trials is considered to yield the highest level of evidence in evaluating the effectiveness of interventions. However, due to the small number of studies and the insufficient evidence of the outcomes, it is difficult to draw definitive conclusions about the effectiveness of remotely delivered parenting interventions for typically developing children. The tentative findings indicate that remotely delivered parenting interventions may improve child development of typically developing children. They seem to have a positive and beneficial impact on children well-being. Hence, remotely delivered parenting interventions may be an appropriate tool for early childhood services and health professionals to keep childcare and family support even in isolation conditions due to COVID-19 or other infectious diseases.

Implications for Research

The small number of included studies suggests that there is an urgent need for large, high-quality trials to evaluate remotely delivered parenting interventions for typically developing children. In addition, the fact that only one of the trials included long-term follow-up results revealed the need for future investigations. Considering that long-term effects of remotely delivered parenting interventions may demonstrate the lasting effects of these kind of programs on child, caregiver and caregiver-child outcomes. Finally, it is necessary to study the effectiveness of interventions which support families during the pandemic due to COVID-19 or other infectious diseases.

Conclusions

This study is the first systematic review assessing the effectiveness of remotely delivered parenting interventions

on caregiver-child interactions and child development. Currently, there is insufficient evidence to draw definitive conclusions and it was not possible to conduct a meta-analysis due to the heterogeneity in the characteristics of the studies, in terms of both the intervention designs and their outcomes. However, these results suggest the need for future methodologically rigorous studies that will assess the effectiveness of remotely delivered parenting interventions for typically developing children. Further studies could substantially contribute to the field of early childhood development.

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Compliance with Ethical Standards

Conflict of Interest The authors declare no competing interests.

Informed Consent Informed consent was obtained from all individual participants (and the legal guardians of participants <18) included in the study.

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References

- Abimpaye, M., Dusabe, C., Nzabonimpa, J., Ashford, R., & Pisani, L. (2019). Improving parenting practices and development for young children in Rwanda: Results from a randomized control trial. *International Journal of Behavioral Development*, 44(3), 205–215. <https://doi.org/10.1177/0165025419861173>.
- Aboud, F. E., & Yousafzai, A. K. (2015). Global health and development in early childhood. *Annual Review of Psychology*, 66, 433–457. <https://doi.org/10.1146/annurev-psych-010814-015128>.
- Attanasio, O. P., Bentham, J., Fernández, C., Fitzsimons, Grantham-McGregor, S., Douglas, C. M., & Rubio-Codina, M. (2014). Using the infrastructure of a conditional cash transfer program to deliver a scalable integrated early child development program in Colombia: Cluster randomized controlled trial. *BMJ*, 349, g5785 <https://doi.org/10.1136/bmj.g5785>.
- Bick, J., & Nelson, C. A. (2017). Early experience and brain development. *WIREs Cognitive Science*, 8, e1387 <https://doi.org/10.1002/wcs.1387>.
- Black, M. M., Walker, S. P., Fernald, L. C. H., Andersen, C. T., DiGirolamo, A. M., Lu, C., McCoy, D. C., Fink, G., Shawar, Y. R., Shiffman, J., Devereckelli, A. E., Wodon, Q. T., Vargas-Barón, E., & Grantham-McGregor, S. (2017). Early childhood development coming of age: science through the life course. *The Lancet*, 389, 77–90. [https://doi.org/10.1016/S0140-6736\(16\)31389-7](https://doi.org/10.1016/S0140-6736(16)31389-7).
- Britto, P. R., Lye, S. J., Proulx, K., Yousafzai, A. K., Matthews, S. G., Vaivada, T., Perez-Escamilla, R., Rao, N., Ip, P., Fernald, L. C. H., MacMillan, H., Hanson, M., Wachs, T. D., Yao, H., Yoshikawa, H., Cerezo, A., Leckman, J., & Bhutta, Z. A. (2017). Nurturing care: promoting early childhood development. *The Lancet*, 389, 91–102. [https://doi.org/10.1016/S0140-6736\(16\)31390-3](https://doi.org/10.1016/S0140-6736(16)31390-3).
- Britto, P. R., Ponguta, L. A., Reyes, C., & Karnati, R. (2015). *A Systematic Review of Parenting Programmes for Young Children*. UNICEF.

- Burrell, L., Crowne, S., Ojo, K., Snead, R., O'Neill, K., Cluxton-Keller, F., & Duggan, A. (2018). Mother and home visitor emotional well-being and alignment on goals for home visiting as factors for program engagement. *Maternal and Child Health Journal*, 22(1), 43–51. <https://doi.org/10.1007/s10995-018-2535-9>.
- Center on the Developing Child. (2020). What Is COVID-19? And How Does It Relate to Child Development? <https://developingchild.harvard.edu/resources/what-is-covid-19-and-how-does-it-relate-to-child-development/>.
- Center on the Developing Child. (2010). The foundations of lifelong health are built in early childhood. www.developingchild.harvard.edu.
- Cluver, L., Lachman, J. M., Sherr, L., Wessels, I., Krug, E., Rakotomalala, S., Blight, S., Hillis, S., Bachman, G., Green, O., Butchart, A., Tomlinson, M., Ward, C. L., Doubt, J., & McDonald, K. (2020). Parenting in a time of COVID-19. *The Lancet*, 395, e64 [https://doi.org/10.1016/S0140-6736\(20\)30736-](https://doi.org/10.1016/S0140-6736(20)30736-).
- Engle, P. L., Black, M. M., Behrman, J. R., Cabral de Mello, M., Gertler, P. J., Kapiriri, L., Martorell, R., & Young, M. E. (2007). Strategies to avoid the loss of developmental potential in more than 200 million children in the developing world. *The Lancet*, 369 (9557), 229–242. [https://doi.org/10.1016/S0140-6736\(07\)60112-3](https://doi.org/10.1016/S0140-6736(07)60112-3).
- Eshel, N., Daelmans, B., de Mello, M. C., & Martines, J. (2006). Responsive parenting: Interventions and outcomes. *Bulletin of the World Health Organization*, 84(12), 991–998. <https://doi.org/10.2471/blt.06.030163>.
- Feil, E. G., Baggett, K., Davis, B., Landry, S., Sheeber, L., Leve, C., & Johnson, U. (2020). Randomized control trial of an internet-based parenting intervention for mothers of infants. *Early Childhood Research Quarterly*, 50, 36–44. <https://doi.org/10.1016/j.ecresq.2018.11.003>.
- Fox, S. E., Levitt, P., & Nelson, C. A. (2010). How the timing and quality of early experiences influence the development of brain architecture. *Child Development*, 81(1), 28–40. <https://doi.org/10.1111/j.1467-8624.2009.01380.x>.
- Graham-McGregor, S., Cheung, Y. B., & Cueto, S., et al. (2007). Developmental potential in the first 5 years for children in developing countries. *The Lancet*, 369, 60–70.
- Gilkerson, J., Richards, J. A., & Topping, K. (2017). Evaluation of a LENA-based online intervention for parents of young children. *Journal of Early Intervention*, 39(4), 281–298. <https://doi.org/10.1177/1053815117718490>.
- Jeong, J., Franchett, E. E., & Ramos de Oliveira, C. V., et al. (2021). Parenting interventions to promote early child development in the first three years of life: A global systematic review and meta-analysis. *PLoS Medicine*, 18(5), e1003602 <https://doi.org/10.1371/journal.pmed.1003602>.
- Jeong, J., Pitchik, H. O., & Yousafzai, A. K. (2018). Stimulation interventions and parenting in low- and middle-income countries: a meta-analysis. *Pediatrics*, 141(4), e20173510 <https://doi.org/10.1542/peds.2017-3510>.
- Lu, C., Black, M. M., & Richter, L. M. (2016). Risk of poor development in young children in low-income and middle-income countries: an estimation and analysis at the global, regional, and country level. *Lancet Global Health*, 4(12), e916–e922. [https://doi.org/10.1016/S2214-109X\(16\)30266-2](https://doi.org/10.1016/S2214-109X(16)30266-2).
- McCoy, D. C., Peet, E. D., & Ezzati, M., et al. (2016). Early childhood developmental status in low- and middle-income countries: national, regional, and global prevalence estimates using predictive modeling. *PLoS Medicine*, 13(6), e1002034 <https://doi.org/10.1371/journal.pmed.1002034>.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., & Mulrow, C. D., et al. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, 372, n71 <https://doi.org/10.1136/bmj.n71>.
- Papalia, D. E., Olds, S. W., & Feldman, R. D. (2006). *Desenvolvimento Humano*. Porto Alegre: Artmed.
- Rayce, S. B., Rasmussen, I. S., Klest, S. K., Patras, J., & Pontoppidan, M. (2017). Effects of parenting interventions for at-risk parents with infants: a systematic review and meta-analyses. *BMJ OPEN*, 7(12). <https://doi.org/10.1136/bmjopen-2016-015707>.
- Richter, L. M., Daelmans, B., Lombardi, J., Heymann, J., Boo, F. L., Behrman, J. R., Lu, C., Lucas, J. E., Perez-Escamilla, R., Dua, T., Bhutta, Z. A., Stenberg, K., Gertler, P., & Darmstadt, G. L., Paper 3 Working Group and the Lancet Early Childhood Development Series Steering Committee. (2017). Investing in the foundation of sustainable development: pathways to scale up for early childhood development. *The Lancet*, 389(10064), 103–118. [https://doi.org/10.1016/S0140-6736\(16\)31698-1](https://doi.org/10.1016/S0140-6736(16)31698-1).
- Sawyer, M. G., Reece, C. E., Bowering, K., Jeffs, D., Sawyer, A. C. P., Mittinty, M., & Lynch, J. W. (2017). Nurse-Moderated Internet-Based Support for New Mothers: Non-Inferiority, Randomized Controlled Trial. *Journal of Medical Internet Research*, 19(7), e258 <https://doi.org/10.2196/jmir.6839>.
- Shah, R., Kennedy, S., Clark, M. D., Bauer, S. C., & Schwartz, A. (2016). Primary Care-Based Interventions to Promote Positive Parenting Behaviors: A Meta-analysis. *Pediatrics*, 137(5), e20153393 <https://doi.org/10.1542/peds.2015-3393>.
- Shonkoff, J. P., & Phillips, D. A. (2000). *From Neurons to Neighborhoods. The Science of Early Childhood Development*. National Academies Press (US).
- Teepe, R. C., Molenaar, I., & Verhoeven, L. (2017). Technology-enhanced storytelling stimulating parent-child interaction and preschool children's vocabulary knowledge. *Journal of Computer Assisted Learning*, 33(2), 123–136. <https://doi.org/10.1111/jcal.12169>.
- Tufanaru, C., Munn, Z., Aromataris, E., Campbell, J., Hopp, L. (2017). Chapter 3: Systematic reviews of effectiveness. In: Aromataris E, Munn Z (Editors). *Joanna Briggs Institute Reviewer's Manual*. The Joanna Briggs Institute.
- UNICEF. (2020). *Early childhood development and COVID-19*. Retrieved from <https://data.unicef.org/topic/early-childhood-development/covid-19/>
- Weisleder, A., Mazzuchelli, D. S. R., Lopez, A. S., Neto, W. D., Cates, C. B., Goncalves, H. A., Fonseca R. P., Oliveira, J., & Mendelsohn, A.L. (2018). Reading aloud and child development: A cluster-randomized trial in Brazil. *Pediatrics*, 141(1). <https://doi.org/10.1542/peds.2017-0723>.
- World Health Organization. (1997). *Improving Mother/child Interaction To Promote Better Psychosocial Development in Children*. World Health Organization.
- World Health Organization (2004). *The importance of caregiver-child interactions for the survival and healthy development of young children: a review*. World Health Organization.
- Yousafzai, A. K., Rasheed, M. A., Rizvi, A., Armstrong, R., & Bhutta, Z. A. (2015). Parenting skills and emotional availability: An RCT. *Pediatrics*, 135(5), e1247–e1257. <https://doi.org/10.1542/peds.2014-2335>.