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# Identifying the Common Elements of Early Childhood Interventions Supporting Cognitive Development in Low- and Middle-Income Countries

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## Abstract

Psychosocial interventions for infants and young children in low- and middle-income countries (LMICs) have great potential, but there is a large and diverse range of techniques and procedures used within them, which poses challenges to evaluating and adapting them for scale-up. Our objective was to review psychosocial interventions conducted in LMICs to improve young children's cognitive outcomes, and identify common techniques used across effective interventions. We systematically searched for relevant reviews using academic databases (PsycINFO, Web of Science, PubMed) and subject-specific databases (EPPI Centre, WHO Global Health Library, UNICEF Publications Database) for publications dated up to March 2021. Reviews of psychosocial interventions aimed at parents and children in LMICs, measuring child cognitive outcomes, were eligible. Study selection was performed in duplicate. Review characteristics and effectiveness data were extracted, with a proportion checked by a second reviewer. AMSTAR2 was applied to assess review strength. The PracticeWise coding system was used to distil practice elements from effective interventions. We included ten systematic reviews demonstrating evidence of effectiveness. Comprehensive interventions of higher intensity and longer duration yielded better results. From these reviews, 28 effective interventions were identified; their protocols and/or linked publications were coded for common practice elements. Six elements occurred in  $\geq 75\%$  of protocols: attachment building, play/pretend, psychoeducation, responsive care, talking to baby, and toys use. Interventions and reviews were highly heterogeneous, limiting generalizability. LMIC-based psychosocial interventions can be effective in improving children's cognitive development. Identifying common practice elements of effective interventions can inform future development and implementation of ECD programs in LMICs.

**Keywords** Early childhood development · Common elements · Psychosocial interventions · Parenting interventions · Cognitive development

## Abbreviations

ECD Early childhood development  
HIC High-income country  
LMIC Low- and middle-income country

SMD Standardized mean difference  
UNICEF United Nations Children's Fund  
WHO World Health Organization

## Introduction

Young children living in high-adversity settings experience high levels of poverty, undernourishment and stunting, inadequate access to early childhood education, and risks in their home environments including parental depression, domestic violence, and drug abuse (Black et al., 2017). Interventions to improve early childhood development (ECD) have proliferated in the last two decades. Typical interventions comprise a diverse set of practices that aim to help young children reach their full developmental potential by enhancing responsive care (Walker et al., 2011). Because

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environmental stimulation affects human brain development most critically in the early years (Grantham-McGregor et al., 2007), interventions implemented during this period can translate to short-term benefits—such as school readiness and reductions in harsh parenting—as well as longer-term benefits, including an increased ability to learn, better school achievement, emotional wellbeing, and cognitive outcomes into adolescence and adulthood (Kagitcibasi et al., 2009; Walker et al., 2018).

Interventions are often targeted at parents and/or other caregivers to promote developmentally appropriate nurturing care by providing learning opportunities for the young child and helping parents and/or caregivers to engage the child in stimulating play activities (Eshel et al., 2006; Jeong et al., 2018). However, there are gaps in how we understand these interventions to work. Notably, few interventions have been longitudinally followed, and there is evidence of “fade-out” where effects are not last-lasting. Existing evidence about intervention effectiveness in the short term is also mixed, as content and delivery strategies, as well as evaluative rigor, can vary substantially (Jeong et al., 2021). These interventions also contain distinct elements that are theorized to drive the same outcomes. Psychosocial interventions may include elements of positive parent–child interactions, including providing positive attention and responsiveness to cues and milestones, encouraging children’s autonomy and exploration of the environment, and promoting attachment (Yousafzai & Aboud, 2014). In practice, however, these interventions are designed and implemented in different ways, with lack of clarity about which components may work best.

Furthermore, much of the highest-quality evidence on early childhood interventions still comes from high-income countries (HICs) (Lipina & Colombo, 2009). While evidence-based practices for promoting parent–child interactions and encouraging cognitive development can ostensibly be widely applied, implementing these well-evidenced interventions in low- and middle-income countries (LMICs) often requires contextual, sociocultural, and resource adaptations (Britto et al., 2018). The group of countries often referred to as LMICs are highly diverse, reflecting a wide range of social, cultural, economic, and political realities. Consequently, the generalizability of findings across LMIC settings is often limited, although the need for low-cost cognitive development interventions that are feasible to implement in low-resource contexts is great (Richter et al., 2017).

As the evidence base grows, there is an increasing need to systematically study and identify the necessary and sufficient components for effective early interventions (Cavallera et al., 2019). Current practice is moving away from a pure effectiveness approach—where interventions are delivered and tested as manualized and sometimes ‘black box’ packages—towards a more flexible approach where key intervention

components, sometimes referred to as common elements, are closely documented or matched to circumstances (of the child, context or level of facilitator expertise) to improve outcomes and scalability (Chorpita et al., 2007; McLeod et al., 2017). Isolating “active” ingredients of interventions could help reduce overlap across a saturated programming field and build consensus about what works. To date, this task has proven difficult due to inconsistency and poor quality in how interventions are described and reported in peer-reviewed literature (Yousafzai et al., 2018). In this review, we aimed to identify effective ECD interventions through conducting a systematic review of reviews and analyzing intervention descriptions to identify common elements that could support future practice.

## Methods

To identify effective intervention programs, we reviewed existing systematic reviews and meta-analyses investigating the effectiveness of interventions in LMICs to improve ECD.

We searched three electronic databases (PsycINFO, Web of Science, and PubMed) and three subject-specific databases (EPPI Centre, WHO Global Health Library, and UNICEF Publications Database) covering the period until the end of March 2021. Reference lists of relevant reviews, including the recently published WHO ECD Guidelines (WHO, 2020), were consulted to identify any additional reviews not captured by the database searches.

## Inclusion Criteria

We included systematic reviews that met the following criteria:

1. Population: Parents and/or primary caregivers of children under 5 years of age;
2. Intervention: Studies evaluating early childhood interventions promoting cognitive development, either as a stand-alone intervention or combined with other intervention strategies, such as nutritional programs (excluded interventions solely focused on material and/or structural interventions, e.g., cash transfers);
3. Comparator: Standard care or active interventions;
4. Outcome: Studies measuring child cognitive outcomes and/or parenting outcomes;
5. Setting: Studies in LMICs only, as defined by the World Bank criteria.

## Search and Screening Strategy

Our search terms (see Table 1) were inclusive, enabling us to find reviews with a wide range of cognitive outcomes.

**Table 1** Search strategy and terms

Terms	
1	“early childhood development” OR “cognitive development” OR “language”
2	“parent*” OR “parent* sensitivity” OR “responsive caregiving” OR “responsive parent*” OR “sensitive parent*” OR “responsive care” OR “parent child relation*” OR “mother child relation*”
3	1 AND 2
4	“childrearing practices” OR “parent child communication” OR “parent* style”
5	4 OR 2
6	“psychosocial stimulation” OR “stimulation intervention*” OR “stimulation”
7	5 AND 1
8	7 AND 6
9	“review” OR “meta-analysis”
10	9 AND 8
11	“low- and middle- income countr*” OR “developing countr*” OR “low resource setting*” OR “task shifting” OR “task sharing”
12	11 AND 10

No language limits were applied to searches. Hand searches of reference lists and the three additional subject specific databases were also conducted. Following identification of reviews through databases and reference list searches, records were screened for relevance based on title and abstract by two reviewers independently.

### Quality Assessment

Two raters (CL and SG) assessed the methodological quality of the included reviews using the AMSTAR2 tool for assessing systematic reviews (Shea et al., 2017). Discrepancies in assessments were resolved through discussion.

### Data Extraction

Following review selection, we identified individual studies that (1) demonstrated effectiveness and (2) were included in reviews that were assessed as “moderate” or “high” quality on AMSTAR2. Effectiveness was ascertained through standardized mean difference (SMD) values, supported by review authors’ conclusions. Core data extracted included country, aim, number of studies, number of total participants, outcomes, and findings including SMD. We then contacted authors of these studies to request the original intervention protocols. Where intervention protocols were not available, published papers of the studies were used to extract information about the intervention content, with coding based on descriptions provided in the articles.

### Common Element Coding

The PracticeWise manual was used for coding common elements (Chorpita et al., 2005). The original manual was developed for high-income contexts, and we adapted this to suit our focus on

the early years in the LMIC context. Elements could relate to intervention content, delivery, or other intervention practices.

Two coders used the PracticeWise manual to review 62 common elements in the available protocols and intervention studies (PracticeWise, 2012). Codes that were not relevant for the purpose of the current review were excluded ( $n = 19$ ). Additional relevant codes were added to the coding structure through the procedure outlined in the manual, adding new elements as free text, and then reviewing these for frequently occurring elements. Through this process, 20 new elements were added (see Table 2). Codes not identified in two or more interventions were omitted from the final list ( $n = 17$ ), leading to a final count of 46 common elements. Several original codes were re-defined to relate to a caregiver, such as *individual therapy-caregiver*. Other definitions of codes were broadened to include early years specific aspects; for instance, the code *caregiver-directed nutrition* was widened to include advice about breastfeeding, weaning, and psychoeducation about portion sizes for young children. For studies identified in the updated search, the early set of codes were applied to a new set of interventions to streamline efforts. In cases where multiple active interventions were tested in a trial (multi-arm study), we included common elements found in the most “involved” or intensive arm (Table 2).

After additional codes were included, two raters (CL, SG) coded elements on a sample of 9 protocols to test for inter-rater reliability ( $\kappa = 0.82$ ).

## Results

### Description of Reviews

We identified 54 records, excluding  $n = 37$  reviews based on title and abstract, and assessed an additional 17 reviews

**Table 2** Elements and descriptions

Element	Description
Accessibility promotion	Any strategy used to make services convenient and accessible or to proactively enhance treatment participation
Antenatal support*	Intervention including antenatal support or preparation for baby strategies to help parents
Attachment building*	Provision of broader training in bonding with the child. This may include psychoeducation/demonstrations/discussions about providing consistent loving care to the child, being accessible to the child as a parent, and being responsive to the child's emotional needs
Attending	Exercises involving the child and caretaker playing together in a specific manner to facilitate their improved verbal communication and nonverbal interaction. Typically, the caretaker is instructed to provide a running commentary or description on the child's activities
Caregiver-directed nutrition	Setting an expectation for parents to take charge of eating and feeding may include aspects of diet, feeding environment, or behavior; may also include advise about breastfeeding/weaning or portion sizes for children
Coaching	Facilitator is encouraged to provide feedback to parents when they try new techniques out, praising where necessary and providing gentle suggestions when they need improvement — as the activity is being carried out
Cognitive techniques	Any techniques designed to alter interpretation of events through examination of the caregiver's reported thoughts, typically through the generation and rehearsal of more realistic, alternative counter-statements
Communication skills	Training for caretakers in how to communicate more effectively with others to increase positive functioning, increase consistency, or minimize stress; may also involve learning to express emotions more effectively
Community peers delivery*	Intervention delivered by community peers, community health workers from the local population, or trained peer tutors
Differential reinforcement	The training of caretakers, teachers, or others involved in the social milieu of the child to selectively ignore target behaviors and selectively attend to competing behaviors
Emotion regulation skills*	Techniques that are designed to promote learning to recognize and manage emotions and understanding emotion-behavior-thought links; may also involve psychoeducation about emotions (coded alongside Psychoeducation), and learning to differentiate between feelings and behaviors, and awareness of the choices to act or not to act on feelings constructively
Family engagement	The use of skills and strategies to facilitate the family's positive interest in participation in an intervention
Giving choices*	Encouraging parents to give children choices in play, feeding to promote child's autonomy and exploration
Homework	The assignment or request that a child/caregiver participate in specific positive activities outside of sessions, with the goal of promoting or maintaining involvement in rewarding and enriching experiences
Hygiene practices*	Information and instructions regarding safe, hygienic practices in the child's environment
Individual therapy for caregiver	Any therapy designed directly to target individual (non-dyadic) psychopathology
Marital therapy	Techniques used to improve the quality of the relationship between caregivers
Medical care or recommendation	Provision of professional services, consultation, education, medications, or advice regarding adaptations to address physical health or well-being
Mentalizing*	Active discussions/questions that are aimed to facilitate/promote caregiver's capacity to mentalize (think and feel what the child thinks and feels) their child
Modelling	Demonstration to the caregiver of a desired behavior, typically performed by a therapist, confederates, peers, or other actors to promote the imitation and subsequent performance of that behavior in parents
Motivational enhancement	Exercises designed to increase readiness to participate in additional therapeutic activity or programs
Nutritional care or recommendation	Provision of counselling, education, professional services, or recommendations for dietary or nutritional modification or supplementation
Parental self-care*	Any strategies that promote parental awareness of importance of their own wellbeing in caring for children, along with techniques aimed to increase parental psychological/physical wellbeing
Parental self-monitoring	Conducted by parents of their own behaviors, including mood charts, behavior diaries
Parenting skills	Provision of broader training in parenting skills not captured by specific other codes — may involve child rights, education, attention to positive qualities of the child, parental supervision and monitoring
Peer support*	If intervention involves a peer support element or group
Performance feedback	Providing information about one's own or another's performance to the youth, parent, or others based on assessment or observation
Physically comforting baby*	Instructions/encouragement to provide physical comfort/soothing baby through touch (swaddling, picking up at distress, gentle touch). May also be coded if intervention includes baby massage as a strategy
Play/pretend*	Parent-child activities using play that provide a rich learning experience for the child

**Table 2** (continued)

Element	Description
Praise	The training of parents in the administration of social rewards to promote desired behaviors
Problem solving	Training in the use of techniques, discussions, or activities designed to bring about solutions to targeted problems, usually with the intention of imparting a skill for how to approach and solve future problems in a similar manner
Psychoeducation—caregiver	The formal review of information with the caretaker (Socratic or otherwise) about the child’s early development
Reducing harsh discipline*	Any instructions/strategies provided to caregivers aimed at reducing harsh/physical/aggressive discipline. Recommendations around more positive ways of dealing with children, reinforcing good behaviors. Information provision about negative effects of harsh discipline on child
Role play*	Caregivers encouraged to act out (with facilitator or each other) either their routine practices (with the aim of understanding what behavior currently looks like), or trying out new strategies/behaviors through role play with the aim to provide rehearsal for novel practices
Session aids*	Facilitation of intervention involves session aids, calendars for participants, or other objects or materials provided
Sleep hygiene/training*	May include psychoeducation about sleep in young children; can include sleep hygiene for parents
Storytelling*	Any strategy that promotes the use and caregivers’ ability to use story-telling with their children
Support networking	Strategies to explicitly identify, engage, develop, or otherwise increase the involvement or effectiveness of individuals in the client’s social ecology to provide instrumental or emotional support for the client or assist in the performance of therapeutic tasks or activities
Supportive listening	Reflective discussion with the participant designed to demonstrate warmth, empathy, and positive regard, without suggesting solutions, actions, or alternative interpretations
Synchrony with baby*	Parent and baby engaging in a give and take in their interactions and communications
Talking to baby*	Any strategies to promote parental involvement in talking with baby, also in the pre-verbal stages; may include imitating babble, singing to baby, expanding on what infant said, paying attention to what infant is looking at and labelling objects, pointing and verbalizing
Therapist praise	The administration of tangible (i.e., rewards) or social (e.g., praise) reinforcers by the therapist (facilitator) to promote a desired behavior in the caregiver
Use of toys*	Strategies (including psychoeducation around why it is important to provide toys for children) to promote the use of toys in parenting practices
Video/live demonstrations*	Intervention makes use of video or live demonstrations

\*Starred elements denote elements added iteratively during the coding process. Elements that did not appear in the first round of coding are not included

in detail. Ten reviews fit inclusion criteria for the current review (see Fig. 1 for PRISMA flow chart). The findings from these ten reviews are detailed in Table 3.

Five of these ten reviews used meta-analyses. However, only three of these meta-analyses focused specifically on cognitive outcomes in children; the remaining two systematic reviews included psychosocial interventions but only conducted meta-analyses on nutrition-specific interventions, a topic outside of the scope of our current review. Several reviews evaluated outcomes on child cognitive and language development ( $n = 7$ ) and parent–child relationships ( $n = 7$ ), while one measured maternal mental health outcomes with a secondary focus on child cognitive development ( $n = 1$ ).

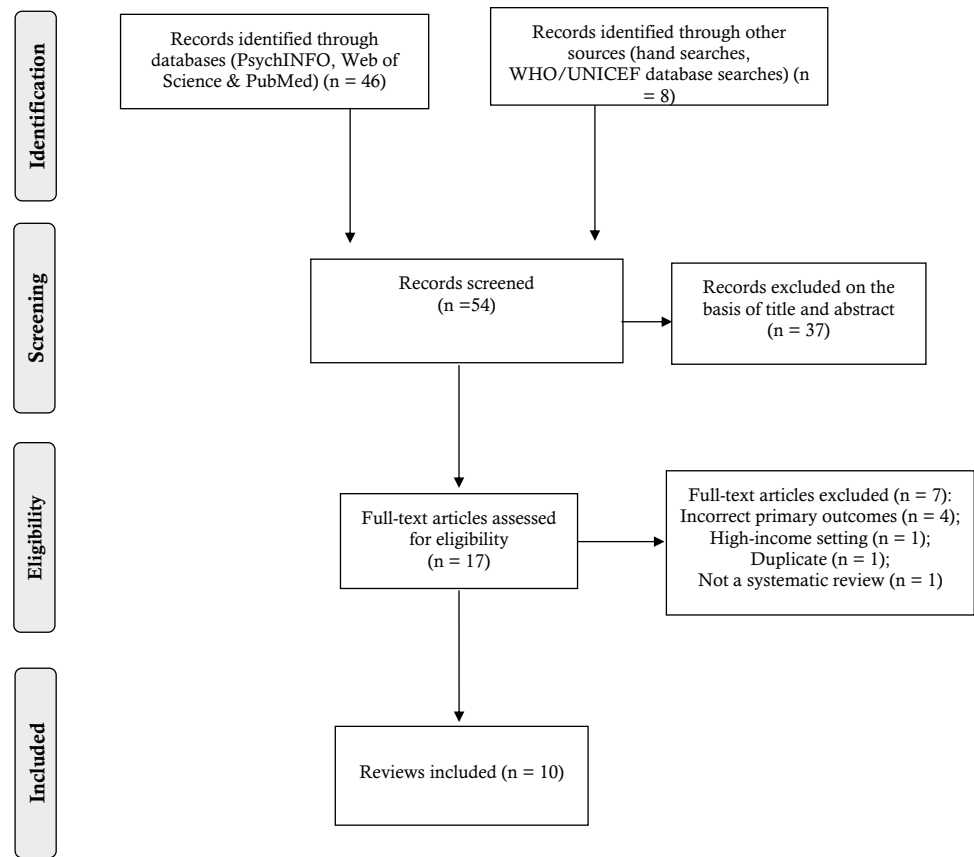
## Interventions

Interventions included: interventions in early infancy focusing on promoting maternal-child interaction; interventions with disadvantaged children and their families; combined

interventions for cognitive development and nutrition programs; interventions to increase parental responsiveness related to feeding, attachment, and general parenting skills; and interventions to encourage learning and play activities, positive discipline, and problem-solving. Some interventions reviewed were parent-focused, with a primary focus on improving maternal mental health with children’s developmental and cognitive outcomes measured as secondary outcomes.

Intervention delivery formats included home visits, group sessions, and clinic appointments; delivered by paraprofessionals visiting the family weekly or monthly, or delivering the sessions to a group of mothers, to talk to and play directly with the child while the parents watched and coaching activities between the parent and child. Play materials were often provided or hand-made in the sessions. Effectiveness of interventions was measured by the effect size of child outcome or the changes in parenting behavior contributing to a more stimulating child environment.

Fig. 1 PRISMA flow chart



## Quality Assessment of Systematic Reviews

The results of the quality assessment using AMSTAR2 tool are summarized in Table 4. Two raters achieved acceptable inter-rater agreement, at Cohen's  $kappa = 0.65$  (95% CI 0.107, 1.207). The confidence in the results of five reviews was judged to be *high*, with three reviews assessed to be of *moderate* quality, and two considered to be of *low* quality. Most reviews considered the heterogeneity of the included interventions and noted the limitations this created for drawing conclusions. A common weakness across reviews was a lack of assessment of publication bias, and an insufficient consideration and discussion of risk of bias. We adopted a more lenient approach to assessing two of these criteria: we measured whether authors considered risk of bias and heterogeneity, without stipulating that authors provide more nuanced assessments. No reviews provided a list of excluded studies and reasons for this as dictated by “gold standard” criteria, nor was the source of funding of individual interventions considered. Few reviews provided a clear indication that the study selection and data extraction was carried out in duplicate. For the current review, these were deemed to be non-critical weaknesses in assessing the strength of confidence in the findings of reviews.

## Overview of Review Findings

Across reviews, several similarities emerged. However, authors also employed a diverse set of strategies to classify outcomes, and extracted different information from included studies. Overall, there were generally large effect sizes identified across reviews in child cognitive and language development, as well as in parenting practices. Aboud and Yousafzai (2015) reviewed and meta-analyzed 21 interventions, and effects were found for cognitive outcomes (SMD = 0.42 [95%CI: 0.36, 0.48]) and language outcomes (SMD = 0.47 [95%CI: 0.37, 0.57]), with high heterogeneity (Aboud & Yousafzai, 2015). Jeong et al.'s meta-analysis (Jeong et al., 2018) on the effects of psychosocial interventions of parent caregiving practices in LMIC settings found medium-to-large effects across multiple domains; these domains included improved home caregiving environment ( $k = 10$ ; SMD = 0.57; 95%CI: 0.37, 0.77), mother-child interactions ( $k = 3$ ; SMD = 0.44; 95%CI: 0.14, 0.74), and maternal knowledge of child development ( $k = 6$ ; SMD = 0.91; 95%CI: 0.51, 1.31). Jeong et al.'s more recent global systematic review and meta-analysis (Jeong et al., 2021) incorporated a broader set of outcomes and interventions than prior interventions, which the authors noted as a strength. The review's sub-group analysis of studies

**Table 3** Summary of included reviews

Review year	Aim (participants)	Search strategy	No. of studies included	Total no. of participants	Interventions reviewed	Outcome	Findings
Aboud and Yousafzai (2015)	To review effectiveness (meta-analysis) of early interventions such as nutritional programs and psychosocial stimulation on children's cognitive and language development (0–24 months)	Followed PRISMA, search terms provided, used 3 databases	21 (also 18 nutrition intervention studies)	Not provided	Included psychosocial stimulation interventions (as well as nutrition interventions)	Cognitive and language developments	Review concludes that stimulation interventions medium effects on children's cognitive and language development. Intervention groups compared to control families were shown to be more verbally responsive to children, providing a more stimulating environment for the child
Baker-Henningham (2014)	To systematically review interventions/programs that prevent child MH problems and promote wellbeing. Caregiver practices and caregiver MH also reviewed (up to 6 years old)	Up to December 2010, search terms provided, QA tools used	21	Not provided	Educational interventions: parenting training, day-care, multi-component interventions in health settings	Child behavior and mental health. Caregiver practices, parental skills to stimulate and provide emotional support	Benefits found for caregiver practices in 21 studies. Most benefits to child mental health when activities aim to increase child cognition, language, self-regulation, and social emotional competence, when caregivers are trained in providing cognitively stimulating environments, and parental mental health is addressed
Baker-Henningham and Lopez Boo (2010)	To systematically review stimulation interventions in LMIC, with primary outcomes on children's cognitive development but also parental benefits (0–5 years)	4 databases searched, outcomes explicitly stated prior to review	26	Not provided	Cognitive stimulation interventions	Child cognitive development (IQ), child behavior, schooling and nutrition. Maternal parenting, mother child interactions	Review concludes that early stimulation interventions are effective in improving child and maternal outcomes, with particularly stronger effects when targeting the most disadvantaged (undernourished) and younger children. Interventions of higher quality and longer duration are more effective



Table 3 (continued)

Review year	Aim (participants)	Search strategy	No. of studies included	Total no. of participants	Interventions reviewed	Outcome	Findings
Britto et al. (2015)	To systematically review ECD parenting programs conducted in LMIC (parents of children up to 8 years old)	10 databases used, 2001–2011, PICO criteria used, search terms provided	105	Not provided	Various ECD parenting interventions reviewed. Psychosocial stimulation studies ( $n=32$ )	Cognitive development and parenting practices outcomes. Also reviewed socio-emotional development and behavioral outcomes, however low frequency of studies looking at this	Intensive (at least weekly for a period of one year) psychosocial stimulation programs are effective in changing parental practices and the child's mental, social and emotional developmental outcomes
Engle et al. (2011)	To systematically assess the effectiveness of early child development interventions, such as parenting support and preschool enrollment (0–5 years)	10 database, publications since 2006, PICO used, search terms provided, QA tools used, outcomes stated prior conducting of review	42 (15 were parenting interventions)	Not provided	Included psychosocial stimulation interventions	Child cognitive development, behavior, attachment, parenting practices	Substantial positive effects on child development were identified in all 11 effectiveness studies; nine on cognitive or social–emotional development, and two on parent knowledge, home stimulation, and learning activities with children, which are associated with child development
Jeong et al. (2018)	To assess the effectiveness (meta-analysis) of stimulation interventions on improving parenting outcomes (0–2 years)	6 databases used, PRISMA followed, search terms provided	15	6267	Psychosocial stimulation: promotion of parenting behaviors and enhancing stimulation	Parental outcomes (mother–child interactions, knowledge of ECD, caregiving environment and maternal depression, opportunities for early stimulation and learning)	Found medium to large effects of stimulation interventions on improving home caregiving environment, observed mother–child interactions and maternal knowledge of ECD. Non-significant results on maternal depression

Table 3 (continued)

Review year	Aim (participants)	Search strategy	No. of studies included	Total no. of participants	Interventions reviewed	Outcome	Findings
Jeong et al. (2021)	To assess the effectiveness of parenting interventions on ECD and parenting outcomes in a global systematic review and meta-analysis (0–3 years)	6 databases used, PRISMA followed, search terms provided	111 publications including 102 RCTs (41 in LMIC)	40,818	Parenting interventions evaluated as RCTs aimed to improve interactions, behaviors, knowledge, beliefs, attitudes, or practices of parents with their children in order to improve ECD	Primary outcomes included six domains of ECD: cognitive, language, motor, and socioemotional development, behavior problems, and attachment; parenting practices evaluated as secondary outcomes	Within the LMIC subgroup, analysis found moderate impact of parenting interventions on cognitive and language and moderate impact on improving parenting practices, with larger effect sizes observed within LMICs than high-income settings
Khatib et al. (2020)	To assess efficacy of stimulation programs for improving ECD in low- and middle-income countries	5 databases used, PRISMA followed, search terms provided, up to February 2019	17	Not provided	Stimulation-focused and/or responsiveness-focused ECD interventions	Child development and/or maternal outcomes	Differential impacts of interventions focused on stimulation and responsive parenting noted, with overall positive benefits
Rahman et al. (2013)	To assess effectiveness (meta-analysis) of interventions to improve MH in perinatal period, evaluate effect on health, growth and development of offspring in LMIC (3 weeks–3 years)	Used 7 databases, search terms provided, up to May 2012	13	20,092	Psychosocial stimulation/maternal mental health interventions: 4 studies in the review addressed maternal depression. Thinking healthy programme, CBT principles culturally adapted. Other studies were psychoeducational with problem solving elements, behavioral elements. Psycho-social stimulation of cognitive development	Maternal mental health outcomes/ Infant cognitive and physical development outcomes, mother–child relationship outcomes	Review concludes that there is evidence that interventions aimed at relief common mental health problems can be effectively implemented in LMIC. Child cognitive development was a secondary outcome not subjected to meta-analysis. Positive effects on infant cognitive development was noted. Small effects on parent–infant relationship was seen
Rao et al. (2017)	To assess effectiveness (meta-analysis) of different ECD interventions in enhancing cognitive development and to identify factors related to intervention efficacy (up to 8 years)	PRISMA followed, 9 databases used, search terms provided, hand searching outlined, specialist websites searches outlined	106 interventions, from 62 studies	43,696	Interventions designed to promote typical cognitive development (mental stimulation), along with nutritional and health interventions	Cognitive and language development outcomes	Review demonstrated a variation in overall effectiveness of ECD interventions for improving cognitive outcomes, with comprehensive programs showing strongest effects

**Table 4** AMSTAR quality appraisals

	1. Inclusion of PICO	2. A priori design	3. Explanation of study selection	4. Comprehensive search strategy	5. Study selection in duplicate	6. Data extraction in duplicate	7. Describes studies in adequate detail	8. Risk of bias assessment
Aboud & Yousafzai 2015	Green	Yellow	Green	Yellow	Red	Red	Green	Green
Baker-Henningham 2014	Green	Yellow	Green	Green	Red	Red	Green	Green
Baker-Henningham & Boo 2010	Green	Yellow	Green	Yellow	Red	Red	Yellow	Red
Britto et al. 2015	Green	Yellow	Green	Yellow	Green	Green	Green	Yellow
Engle et al. 2011	Green	Yellow	Green	Green	Green	Green	Green	Yellow
Jeong et al. 2018	Green	Green	Green	Green	Green	Green	Green	Green
Jeong et al. 2021	Green	Green	Green	Green	Green	Green	Yellow	Green
Khatib et al. 2020	Green	Red	Red	Yellow	Red	Red	Yellow	Red
Rahman et al. 2013	Green	Green	Red	Green	Green	Red	Green	Green
Rao et al. 2017	Green	Yellow	Green	Yellow	Green	Green	Green	Green

wwin LMICs ( $k=41$  of the total 102 trials evaluated) identified significant positive improvements in child cognitive development outcomes ( $k=32$ ,  $SMD=0.41$ ,  $95\%CI: 0.29, 0.53$ ,  $P<0.001$ ), language outcomes ( $k=25$ ,  $SMD=0.35$ ,  $95\%CI: 0.21, 0.48$ ,  $P=0.002$ ), and on parenting practices ( $SMD=0.47$ ;  $95\%CI: 0.34, 0.61$ ,  $P<0.001$ ). No significant effects were identified across parenting knowledge, parent–child interaction, or parental depression. The authors note that these large effect sizes are likely closely linked to the strategies commonly utilized across interventions that target early play and learning opportunities.

Other reviews looked to distinct groupings of interventions. Britto et al., investigating parenting programs ( $k=105$ ), found that stimulation interventions were found to yield better results than interventions with a sole focus on nutrition (Britto et al., 2015). Rao et al. (2017) meta-analyzed studies by intervention focus area, with child-focused education and stimulation interventions comprising the largest grouping ( $k=37$ ), followed by parent-focused education and support interventions ( $k=22$ ) and comprehensive interventions integrating aspects of both child and parent stimulation ( $k=4$ ) (Rao et al., 2017). Comprehensive programs had the largest positive effects on cognitive development ( $g=1.05$ ,  $95\%CI: 0.5, 1.61$ ), followed by child-focused stimulation interventions ( $g=0.64$ ,  $95\%CI: 0.42, 0.85$ ), and parent-focused education and support interventions ( $g=0.44$ ,  $95\%CI: 0.26, 0.61$ ).

There was also some emerging evidence of differential intervention impact by socioeconomic status. Among the outcomes for which Jeong et al. (2021) found significant

improvements, intervention effects were greater among interventions delivered in LMICs than those in HICs (Jeong et al., 2021). Examples include parenting practices ( $SMD=0.47$ ,  $95\%CI: 0.34, 0.61$ ,  $P<0.001$  in LMICs, versus  $SMD=0.08$ ,  $95\%CI: -0.01, 0.16$  in HIC) and child cognitive development ( $SMD=0.41$ ,  $95\%CI: 0.29, 0.53$ ,  $P<0.001$  in LMIC versus  $SMD=0.17$ ,  $95\%CI: 0.10, 0.22$  in HIC). As the authors note, however, no studies directly compared the same intervention between LMIC and HIC settings. Rao et al. found significantly different program effects from child-focused educational interventions, with an effect size nearly double in LMICs (0.64) compared to HICs (0.35) (Rao et al., 2017). Engle et al.'s review, too, identified larger effect sizes in studies conducted among socioeconomically disadvantaged populations (Engle et al., 2011).

There was some inconsistency across reviews about the moderation of effect by intervention characteristics. Britto et al.'s review of parenting programs ( $k=105$ ), including interventions for parenting practices, parent–child interactions, and parenting knowledge, beliefs, and attitudes reviewed studies for intensity, delivery model, approach, staffing, and program type (Britto et al., 2015). Studies with no intervention impact ( $k=14$ ) were typically delivered in a didactic manner and in lower dosages; these were often interventions where parents did not have direct interactions with children during the intervention. More frequent program contact was also associated with greater effectiveness, a finding echoed by Baker-Henningham and Lopez Boo's comprehensive literature review (Baker-Henningham & Lopez Boo, 2010). Based on these findings, the authors recommended

implementation periods of 12 months or longer to achieve optimal improvements.

Engle et al. found larger effect sizes for interventions including both parents and children and encouraging parent–child interventions (median  $d=0.46$ , range 0.04–0.97) compared to those targeting parents only (median  $d=0.12$ , 0.03–0.34) (Engle et al., 2011). Programs reported as most effective in this review were those with a structured curriculum, systematic training for intervention implementers, and opportunities for parents to actively practice new strategies with children and receive feedback. While the review by Rahman et al. (2013) had a slightly different focus—maternal interventions for common mental health problems—it examined secondary outcomes of child cognitive and physical development and mother–child interactions (Rahman et al., 2013). There were additional benefits identified from maternal participation in interventions, which improved knowledge about children’s needs and higher sensitivity, and provided improved home stimulation environments, as well as encouraging mothers to spend time playing with their children. These findings were echoed by reviews by Khatib et al. (2020) and Baker-Henningham (2014).

Jeong et al. also identified that parenting interventions that promoted responsive caregiving had significantly greater effects on parenting knowledge, practices, and parent–child interactions, as well as children’s cognitive development. However, when considering factors such as child age, the duration of the intervention, mode of delivery, or setting, they found no significant moderation effects on more than one outcome (Jeong et al., 2021).

## Common Elements

We extracted common elements from intervention studies that (1) demonstrated intervention effects on children’s cognitive or parenting outcomes and (2) were part of systematic reviews identified as high-quality reviews by our AMSTAR2 process.

In total, 36 effective interventions were identified. Because several trials tested the same intervention protocol, we streamlined this number to  $n=28$  distinct intervention protocols for common elements extraction (see Table 5).

Common elements were derived from intervention protocols and/or manuals specific to the intervention, where we were able to obtain them from the authors ( $n=13$ ), as well as intervention descriptions contained in outcomes papers and doctoral theses ( $n=15$ ). Figure 2 summarizes elements by frequency across interventions.

We grouped common elements under six broad “umbrella” themes: facilitator-focused elements, session-based content, parent-focused elements, enhancing parent–child interactions, psychoeducation, and techniques.

Facilitator-focused elements included skills that facilitators used within sessions to encourage parents. Session-based elements included materials or practices that supported the facilitators within intervention setting sessions. Parent-focused elements included components that supported parents as individuals, whether through enhancing their skills or supporting their wellbeing. Enhancing parent–child interactions, the largest category, included skills and practices that aimed to shape and improve interactions between parent and child. Psychoeducation included any education-related provision within the session. Finally, techniques referred to other cross-cutting parenting practices covered in sessions that did not fall neatly into other categories.

While *caregiver psychoeducation* was the most common element (100%), strategies to enhance parent–child interaction were similarly well-represented—including *play/pretend* (92.9%), *talking to the baby* (85.7%), *responsive care/parenting* (85.7%), *use of toys* (78.6%), and *attachment building* (75%) among the most common.

*Psychoeducation* included providing parents with information about stages of infant development (World Health Organization, 2012). Parents are advised about how to best engage the child given their level of ability. Similarly, interventions provided information on the learning benefits of children’s self-feeding, which included motor coordination skills; cognitive development through learning different shapes, textures, and tastes; and gaining a sense of mastery of doing things by themselves (Aboud & Akhter, 2011).

The *play/pretend* element was often described to parents as children’s “work,” through which they learn about themselves, others, and the world. Protocols provided recommendations for play activities most commonly for children under 2 years of age, and parents were often encouraged to continue these activities in their own time. Often this element was coded alongside *caregiver psychoeducation*, as caregivers learned about play activities as a means of promoting children’s healthy development through seeing, hearing, touch, movement, and taste (Yousafzai et al., 2014). *Play/pretend* was also often coded alongside *use of toys*, as many interventions ( $n=23$ ) made use of simple, often hand-made toys, sometimes crafted as part of the intervention activities from household or other common materials.

The *responsive parenting* element was observed across protocols in diverse ways (Cooper et al., 2009; Singla et al., 2015), where activities encouraged parents to engage in a two-way talk with their child about a picture and respond to the child’s interests and sounds, as well as follow their lead to create a mediated learning experience. This element also included responsive physical care, such as responsive feeding.

The *talking to baby* element, encouraging communication and narration from caregivers to infants, was described across protocols as aimed at enhancing learning and bonding

**Table 5** Overview of included interventions

Author, year	Title	Countries of implementation	Intervention name/description	Data source	Additional authors from current review citing this protocol	Description of the intervention
Abimpaye et al. (2020)	Improving parenting practices and development for young children in Rwanda. Results from a randomized control trial	Rwanda	First Steps (Itera za Mbere)	Publication	n/a	First Steps, or "Itera za Mbere", is a parenting intervention focused on promoting responsive caring and bonding, providing stimulation through playful learning, supporting child health, and promoting emergent literacy in the home volunteer. Both the "light touch" and "full" intervention groups received weekly parenting education sessions facilitated by radio, supported by a local intervention group included more intensive training for the local volunteer, book gifting to participating families, and support from a facilitator to guide group sessions and conduct home visits
Aboud and Akhter et al. (2011)	A cluster randomised evaluation of a responsive stimulation and feeding intervention in Bangladesh	Bangladesh	Responsive Feeding and Play	Intervention manual	n/a	This intervention delivered 12 informational sessions on health and nutrition as well as an additional 6 sessions where facilitators modelled and coached mother-child practice in self-feeding and verbal responsiveness with the child
Aboud (2007)	Evaluation of an early childhood parenting program in rural Bangladesh	Bangladesh	Plan International Bangladesh — parenting program	Publication	n/a	This parenting intervention involved discussion of child feeding, hygiene, cognitive and language development, discipline, and child rights. It consisted of 90-min weekly education sessions delivered by a trained facilitator and tailored to be culturally appropriate
Andrew et al. (2020)	Effects of a scalable home-visiting intervention on child development in slums of urban India: evidence from a randomised controlled trial	India	Reach Up and Learn (adapted), same core intervention for psychosocial stimulation as Grantham-McGregor et al. 2020 below	Publication with supporting evidence (Grantham-McGregor & Walker 2015)	n/a	This psychosocial stimulation intervention comprised weekly 1-h home visits delivered by local home visitors for 18 months. The intervention followed a structured curriculum of developmentally appropriate activities using low-cost homemade toys and picture books, based on the Reach Up and Learn model and adapted to the local context. Home visitors demonstrated activities, provided caregivers opportunities to practice, and encouraged caregivers to respond to their children's actions and vocalizations

Table 5 (continued)

Author, year	Title	Countries of implementation	Intervention name/description	Data source	Additional authors from current review citing this protocol	Description of the intervention
Ara et al. (2019)	Peer counseling promotes appropriate infant feeding practices and improves infant growth and development in an urban slum in Bangladesh: a community-based cluster randomized controlled trial	Bangladesh	Peer counsellor intervention	Publication	n/a	This study combined an infant feeding peer-counseling program with psychosocial stimulation to improve children's development, growth, and child-feeding practices, as compared to receipt of usual health messages. The counseling took place at home and included the mothers and key family members, and group sessions were held biweekly. Intervention participants also received a feeding bowl and spoon, handwashing solution, and homemade toys
Graeme et al. (2006)	Early childhood development through an integrated program: Evidence from the Philippines	Philippines	Comprehensive ECD program	Report	n/a	The intervention was a government initiative, implemented through adding a new health worker cadre, child development workers, in all program areas to deliver food and nutritional supplements, child growth monitoring, community-based parent education about ECD, with special attention paid to marginalized families or communities. Home visits were integrated into this intervention
Aukanda et al. (2019)	Nutrition, hygiene and stimulation education for impoverished mothers in rural Uganda: Effect on Maternal Depression Symptoms and Their Associations to Child Development Outcomes	Uganda	Nutrition education intervention with child stimulation	Publication	Nutrition, hygiene, and stimulation education to improve growth, cognitive, language, and motor development among infants in Uganda: A cluster-randomized trial (Muhoozi et al., 2018)	This intervention was delivered by an education team of 4 trained individuals along with a village health team leader from the community. Three main sessions each lasting 6 to 8 h were delivered to impoverished mothers, covering cooking demonstrations, nutrition education, hygiene and sanitation, and importance of play in child development. The village health team leader conducted additional follow-up sessions with mothers
Boivin et al. (2013)	A year-long caregiver training program to improve neurocognition in preschool Ugandan HIV-exposed children	Uganda	Mediational intervention for sensitizing caregivers, for caregivers of HIV-exposed uninfected preschool-age children	Publication	n/a	The intervention consisted of 25 home visits conducted fortnightly for 12 months. Instruction, demonstration, and practice on how to interact with the child. Caregivers received feedback on videos of their own interactions

Table 5 (continued)

Author, year	Title	Countries of implementation	Intervention name/description	Data source	Additional authors from current review citing this protocol	Description of the intervention
Carlo et al. (2013)	Randomized trial of early development intervention on outcomes in children after birth asphyxia in developing countries	India, Pakistan, Zambia	Partners for learning	Publication	n/a	In this intervention, participants received health, and safety counselling in addition to home visits for 3 years (fortnightly) to promote play by helping parents practice and receive ongoing feedback
Chang et al. (2015)	Integrating a parenting intervention with routine primary health care: A cluster randomized trial	Jamaica	Parenting Program in Health Centres	Intervention manual	n/a	The intervention was integrated into health center visits at 5 routine visits between 3–18 months. Short films with child development messaging were shown in waiting rooms, with community health worker-led discussions and demonstrations and practice opportunities for mothers
Cooper et al. (2009)	Improving quality of mother-infant relationship and infant attachment in socioeconomically deprived community in South Africa: randomised controlled trial	South Africa	Thula Sana (Adaptation of Social Baby program in UK)	Intervention manual	n/a	The intervention was implemented through a series of home visits by trained peer counsellors, encouraging sensitive, responsive interactions. Sixteen sessions were delivered over 6 months of 1 h duration, staggering frequency from weekly to fortnightly, then monthly
Gardner et al. (2005)	Zinc supplementation and psychosocial stimulation: effects on the development of undernourished Jamaican children	Jamaica, Bangladesh	Jamaica Home Visiting Programme (1989)	Intervention manual	The effect of early stimulation on maternal depression: a cluster randomised controlled trial (Baker-Henningham et al. 2005); psychosocial stimulation Improves the Development of Undernourished Children in Rural Bangladesh (Hamadani et al. 2006); psychosocial stimulation benefits development in nonanemic children but not in anemic, iron-deficient children (Toftail et al. 2013); using the infrastructure of a conditional cash transfer program to deliver a scalable integrated early child development program in Colombia: cluster randomized controlled trial (Attanasio et al. 2014)	The intervention to improve maternal-child interactions, demonstrating activities for play and stimulation, language development, fine motor skills, and problem solving. It consisted of weekly 30-min home visits for 6 months coupled with zinc supplementation

Table 5 (continued)

Author, year	Title	Countries of implementation	Intervention name/description	Data source	Additional authors from current review citing this protocol	Description of the intervention
Gardner, Walker et al. (2003)	A randomized controlled trial of a home visiting intervention on cognition and behaviour in term low birthweight infants	Jamaica, Bangladesh	WHO improving mother/child interactions to promote better psychosocial development in children	Intervention manual	Psychosocial intervention improves the development of term low-birth-weight infants (Walker, Chang et al. 2004); effectiveness of a parenting program in Bangladesh to address early childhood health, growth and development (Aboud, Singla et al. 2013)	The intervention aimed to increase "conversation" between mother and infant, improve attachment and sensitivity, and enhance stimulation. It consisted of weekly home visits by community health workers for the first 8 weeks of life
Grantham-McGregor et al. (2020)	Group sessions or home visits for early childhood development in India: a cluster RCT	India	Reach Up and Learn (adapted from Andrew et al., 2020 version, with a nutritional add-on that some families received)	Publication with supporting evidence (Grantham-McGregor & Walker 2015)	n/a	This study adapted the Reach-Up and Learn home visiting intervention. The facilitators used home visiting and group sessions to deliver messages about nutritional education and basic hygiene practices through games, stories, and cooking demonstrations. In the psychosocial stimulation component, facilitators showed mothers how to play and interact with and respond to their children in ways likely to promote development. Materials were handmade toys and purpose-designed books. Play materials were given to mothers to use at home and exchanged weekly
Janssens and Rosenberg (2014)	The impact of a home-visiting early childhood intervention in the Caribbean on cognitive and socioemotional child development	St. Lucia	Roving Caregivers Programme	Report	n/a	The intervention, focused on children living in poor communities, included home visits twice weekly for up to three years by a "rover" (facilitator), encompassing age-appropriate play activities with child and parent. Monthly parenting meetings in local community centers are also part of this program
Jin et al. (2007)	"Care for Development" intervention in China — prospective follow up study	China, Pakistan	Care for Child Development (WHO)	Intervention manual	Parenting skills and emotional availability: an RCT (Yousafzai et al. 2015)	The intervention consisted of two counseling sessions, conducted over a span of 6 months using Care for Development Mother's Cards, to deliver age-specific messages on play, talk, and feeding



Table 5 (continued)

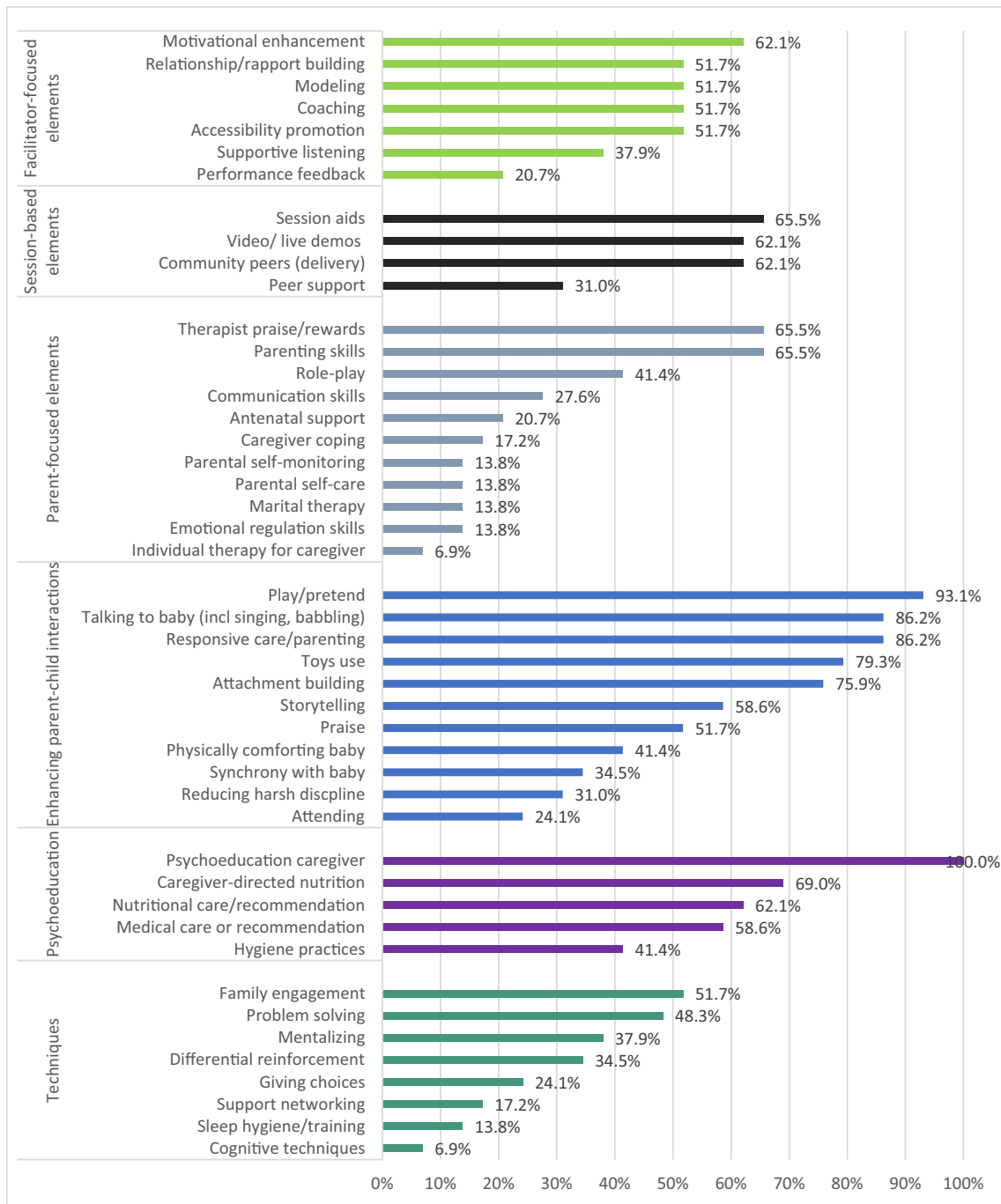
Author, year	Title	Countries of implementation	Intervention name/description	Data source	Additional authors from current review citing this protocol	Description of the intervention
Khan et al. (2018)	Is integrated private-clinic based early child development care effective? A clustered randomized trial in Pakistan	Pakistan	Clinic-based maternal counselling intervention	Publication	n/a	An intervention targeting infants from poor urban localities, which aimed to improve mothers' ability to promote age-appropriate activities for ECD, improve child nutrition, and maternal mental health. Clinic assistants provided counseling for mothers during quarterly visits using a flip-book tool
Luo et al. (2019)	Using community health workers to deliver a scalable integrated parenting program in rural China: a cluster-randomized controlled trial	China	Integrated home visiting programme implemented through China's Family Planning cadres	Publication with supporting evidence (Sylvia et al. 2021)	n/a	An integrated home visitation program combining parental training in child psychosocial stimulation and child health promotion. Local community health workers provided training and education for caregivers on interactive caregiver-child activities to support child development and child health promotion, including appropriate child nutrition, hygiene habits, and other health-promoting behavior (e.g., oral hygiene of infants) by the primary caregiver
Morris et al. (2012)	Does combining infant stimulation with emergency feeding improve psychosocial outcomes for displaced mothers and babies? A controlled evaluation from northern Uganda	Uganda	Psychosocial intervention adapted for internally displaced mothers and infants	Intervention manual	n/a	This intervention was based on the Learning Through Play Programme. It included instructions for infant feeding, psychoeducation about childhood development, mother-infant group sessions, and an unspecified number of home visits
Nahar et al. (2009)	Effects of psychosocial stimulation on growth and development of severely malnourished children in a nutrition unit in Bangladesh	Bangladesh	Stimulation intervention	Doctoral thesis	n/a	The intervention was implemented by health workers trained as play leaders, who delivered 1-h play sessions with caregivers and parental education on stimulation, integrating developmental activities into daily play, and talking with children. Home visits were also done
Pearson et al. (2008)	Cognitive development and home environment of rural Paraguayan infants and toddlers participating in Pastoral de Nino an early childhood development program	Paraguay	Pastoral del Nino	Publication	n/a	This intervention, mostly implemented by volunteers, focused on encouraging sensitive and responsive parenting, child development through play, creating a healthy home environment, and verbal stimulation, as well as education around nutrition and health

Table 5 (continued)

Author, year	Title	Countries of implementation	Intervention name/description	Data source	Additional authors from current review citing this protocol	Description of the intervention
Potterton et al. (2010)	The effect of basic home stimulation programme on the development of young children infected with HIV	South Africa	Home stimulation program	Doctoral thesis, protocol	n/a	The intervention, a basic stimulation program, comprised individual home programs designed by a physiotherapist focused on enhancing child stimulation using activities of daily living and developmentally appropriate play. This was updated every 3 months when children came for clinic visits in addition to usual services
Rahman et al. (2008)	Cognitive behaviour therapy-based intervention by community health workers for mothers with depression and their infants in rural Pakistan: a cluster-randomised controlled trial	Pakistan	Thinking Healthy	Intervention manual	n/a	This intervention used a cognitive-behavioral to engage mothers during pregnancy and early infancy. Messages were focused around maternal self-care, mother-child bonding, and support seeking. Home visits by trained lay health workers occurred every 4 weeks during pregnancy, with three sessions during first month after birth followed by nine additional sessions once monthly
Rahman et al. (2009)	Cluster randomized trial of a parent-based intervention to support early development of children in a low-income country	Pakistan	Learning Through Play, adapted	Publication	n/a	This intervention is centered on a pictorial calendar covering multiple stages of child development, through which parents learn about responsive caregiving, learning, attachment, and communication. Parents are engaged beginning in the third trimester of pregnancy in center-based group sessions and fortnightly individual home visits
Shi et al. (2020)	The effectiveness and cost-effectiveness of a parenting intervention integrated with primary health care on early childhood development: a cluster-randomized controlled trial	China	Integrated ECD intervention, some content adapted from CCD	Publication	n/a	This study integrated a parenting intervention within existing primary health care services. Caregivers in the intervention group received a parenting pamphlet and 2 parenting training sessions during well-child clinic visits. Caregivers with children with suspected developmental delays received additional parenting guidance by telephone

Table 5 (continued)

Author, year	Title	Countries of implementation	Intervention name/description	Data source	Additional authors from current review citing this protocol	Description of the intervention
Singla et al. (2015)	Effects of a parenting intervention to address maternal psychological wellbeing and child development and growth in rural Uganda: a community-based, cluster randomised trial	Uganda	Parenting Programme: Plan Uganda	Intervention manual	n/a	The intervention, conducted through group sessions and home visits, encouraged parents to learn new parenting practices, engage in play and communication with their child, and practice self-care. There were 12 sessions held every 2 weeks, with two additional home visits
Vazir et al. (2013)	Cluster-randomized trial on complementary and responsive feeding education to caregivers found improved dietary intake, growth and development among rural India toddlers	India	Responsive complementary feeding and play group	Intervention manual	n/a	The intervention focused on responsive feeding, mother-child interaction, and education around appropriate breastfeeding and complementary feeding. It centered around 19 core messages on feeding, eight on stimulation, delivered over a total of 30 home visits by trained village women
Yousafzai et al. (2014)	Effect of integrated responsive stimulation and nutrition interventions in the Lady Health Worker Programme in Pakistan on child development, growth, and health outcomes: a cluster randomized factorial effectiveness trial	Pakistan	Pehla Qadam (based on CCD)	Intervention manual and accompanying materials	n/a	This intervention was based on Care for Child Development (CCD; see above) and included responsive play and communication skills and activities adapted for local context. It was delivered through monthly group sessions and home visits



**Fig. 2** Frequencies of common practice elements, by umbrella theme

(Chang et al., 2015). This element was also coded in cases where caregivers were encouraged to sing, babble, or make eye contact with babies, including verbal and non-verbal communication between the parent and the child. This element also linked with *attachment building*, including building trust, showing love, and providing safety and security.

Within broader categories, other elements emerged. *Family enhancement* was common among techniques used, as

were strategies to support *problem-solving*. *Session aids, live or video demonstrations*, and *peer-based delivery* methods were common. Nearly two-thirds of interventions included strategies to increase *motivational enhancement* and just over half of interventions included facilitator-specific elements such as *relationship/rapport building, modelling, coaching*, and *accessibility promotion*, to support buy-in and uptake of core intervention content. Furthermore,

nearly two-thirds of interventions involved facilitator *praise* for the caregiver, as well as more general *parenting skills*, with other parent-focused provisions more intermittently included.

## Discussion

This review of reviews and accompanying common elements analysis evaluated the evidence and distilled elements underpinning ECD interventions in LMIC contexts to provide a clearer picture of what works to improve child cognitive and parenting outcomes.

## Findings in Context

The ten included systematic reviews found evidence of effectiveness across psychosocial interventions implemented in LMICs. Comprehensive interventions of higher intensity and longer duration yielded better results (Baker-Henningham, 2014; Britto et al., 2015; Engle et al., 2011), whereas less effective interventions were typically delivered didactically, without parent–child interaction, and in lower dosages (Britto et al., 2015). Interventions addressing maternal mental health during the perinatal period also emerged as beneficial for children’s cognitive development (Rahman et al., 2013). While three reviews found stronger intervention effects when the most disadvantaged groups and younger children were targeted (Baker-Henningham & Lopez Boo, 2010; Engle et al., 2011; Khatib et al., 2020), these conclusions should be considered tentatively, given low confidence ratings in the quality assessment for two of these reviews.

Our analysis of common elements identified a core set of elements used across 28 early childhood interventions. The most commonly occurring elements were, in order, *caregiver psychoeducation*, *play/pretend*, *talking to baby*, *responsive parenting*, *use of toys*, and *attachment building*, each present in  $\geq 75\%$  of protocols of effective interventions. Synthesizing the common elements present across most effective interventions in LMIC settings can enable conversations about how these components may bolster parents’ skills across varied settings, as well as where gaps exist in applying the most up-to-date evidence.

Overall, these elements aligned with literature on best practices for child development and parenting, reiterating that many of the trials of interventions assessed were supported by evidence-based practices and translatable to LMICs. Our analysis elicits key considerations for implementing ECD interventions in LMIC settings and highlights several important provisions to support. In considering the combination of responsive care with a focus on learning opportunities and key milestones, we found that many interventions integrated the twin aims of ECD interventions as

articulated by Aboud and Yousafzai: providing early learning opportunities for children, and teaching responsive parenting (Aboud & Yousafzai, 2019). Of the 25 interventions that included the element of *responsive care*, 84% ( $n=21$ ) included *toys use*, and 100% included *play/pretend*—indicating that interventions are providing opportunities for both early learning and play, as well as responsiveness and sensitivity to children’s cues.

Our analysis also draws out elements that support optimal child development in settings that are significantly resource-constrained. Firstly, elements such as attachment building and talking to baby may be particularly important for promoting socioemotional development in the context of additional environmental stressors. Additionally, it may be valuable to consider integrating a nutritional component—which many interventions did through direct nutritional supplementation or psychoeducation about child feeding (Andrew et al., 2020; Atukunda et al., 2019; Galasso et al., 2019; Gardner et al., 2005). In settings where child stunting is high, combined approaches to child development may be essential to safeguard gains from ECD interventions. These intervention approaches are often complementary (Black & Aboud, 2011). Lastly, where resources are constrained, task-shifting to non-specialists may be essential (Gilmore & McAuliffe, 2013; Seidman & Atun, 2017). Over half of the included interventions ( $n=18$ , 62%) were designed for delivery by community-based peers who received program-specific training. Specific skills informed by evidence-based approaches may be particularly important in ensuring intervention acceptability and uptake in LMIC settings. For example, interpersonal “soft” skills, paired with an educational dimension, have been shown to be important in home visiting interventions in low-literacy settings (Laurenzi et al., 2019).

## Implications for Practice and Future Directions for Research

This review has several implications for practice and policy. In the field of early intervention, new programs are routinely branded as “new interventions” resulting in a plethora of interventions. In resource-constrained settings, common element approaches that are more generic and transdisciplinary are key. The evidence base is mature enough to make a strong case that efficacy and effectiveness studies are no longer needed, especially to evaluate distinct, “new” interventions. Implementation science evidence could support the rollout of existing effective interventions at larger scale (Rotheram-Fuller et al., 2017).

Future research should investigate how intensity and duration of interventions may be linked with child outcomes. Several included reviews (Britto et al., 2015; Engle et al., 2011) emphasized how longer, higher-intensity psychosocial interventions can protect and buffer against

cognitive developmental delays in the most disadvantaged children—including undernourished and low birthweight children, as well as those living with HIV. Common elements analyses should investigate “dose–response” relationships between interventions and outcomes, to enable cost-effectiveness considerations. Understanding the minimal intensity required to achieve intended effects is important, as longer exposure typically results in more consistent and larger effects on child development (Engle et al., 2007), yet may drive up costs. Importantly, dosage should be carefully considered alongside quality and participant engagement, without assuming that more exposure will result in better outcomes. Similarly, long-term follow-ups of child participants are needed to investigate specific long-term effects of psychosocial interventions.

Building on the idea that evidence-based interventions share common elements that can be distilled through this kind of analysis, future research should explore the “matching” part of the distillation and matching model developed by Chorpita et al. (Chorpita et al., 2005). The model suggests that following distillation, clinicians can select common elements that apply to a particular problem or target population (Chorpita et al., 2007). To do this effectively in LMIC contexts, common element analyses would need to expand beyond content to focus more specifically on intervention implementation, including frequency, delivery method (group, individual, home visits), duration, training and supervision of implementers, characteristics of the target populations, cultural adaptation, and context. The age and developmental stage of the child, too, may influence which components are applied, or how they may be adapted to be best matched. Common element research could also focus on the process of adaptation to specific contexts, to identify how interventions can be planned and replicated in new settings.

### Limitations of This Review

This analysis has several limitations. The substantial heterogeneity of most systematic reviews limits the generalizability of the findings; however, the overall pattern of evidence strongly supports early interventions in improving children’s cognitive outcomes. Because many interventions were delivered as part of larger programs incorporating multiple elements to improve parental sensitivity and responsiveness, it is difficult to attribute direct effects of specific intervention elements on children’s cognitive outcomes. Our analysis of common elements suggests that benefits for children’s cognitive outcomes likely accrue when interventions target children’s needs holistically (including nutrition, stimulation, parental responsiveness, hygiene) (Black et al., 2017; Walker et al., 2011). Nevertheless, future research will benefit from the work undertaken here, by meta-analytically analyzing

program effects according to the elements they contain. This, alongside other approaches, will help identify which program elements are critical for delivering optimal outcomes. Adding an age-specific dimension to these analyses may also help to further disentangle differential effects of components on children of different ages and developmental stages; however, as Jeong and colleagues note in their review, parenting and early stimulation interventions have been found to be beneficial no matter the age of the child nor the timing at which the intervention is introduced to the child (Jeong et al., 2021).

Our common element analysis also faced certain limitations. Using the PracticeWise manual as a key source, our coding scheme focused predominantly on content; however, we did not systematically extract data on frequency, session duration, or other measures of intervention intensity. Assessing intervention intensity may be important in understanding treatment effects at a more granular level. The distillation and matching model also has some inherent limitations, such as key elements being identified based on presence or absence in a given intervention, instead of dosage or how well an element is integrated (Chorpita et al., 2007).

We also relied on different data sources to populate the common elements database, including both intervention protocols/manuals and peer-reviewed publications. Diverse sources, including supporting evidence, enabled us to triangulate data about which elements were present in each intervention. However, these sources also reduced the level of standardization by presenting different reporting practices. Where we relied on published papers for description of the intervention, the coding was less detailed than where an intervention manual was available, and may not have been as rich in description, meaning that some information about the intervention contents may have been missed.

Despite these limitations, the results of the review offer valuable insights into elements of effective early psychosocial interventions conducted in LMICs.

### Conclusion

As researchers and policymakers seek effective, and cost-efficient, ways to improve child development—and to safeguard gains from the past two decades as the COVID-19 pandemic alters the global economic landscape—it is critical to gather evidence about what works to support positive outcomes for child development in LMICs. Given resource constraints, continuing to develop novel interventions is unnecessary and expensive. Continued efforts to build evidence around the most effective ingredients in interventions to improve child development should seek to optimize and streamline these elements to be more accessible to a greater number of people.

**Author Contribution** Dr. Mamedova conceptualized and designed the study, conducted analyses, and drafted the initial manuscript. Prof. Fearon conceptualized and designed the study, supported interpretation of findings, and contributed to the writing of the manuscript. Dr. Laurenzi, Ms. Gordon, and Prof. Tomlinson conducted additional analyses and contributed to the writing, review, and revision of the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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**Data Availability** The data is available upon reasonable request.

## Declarations

**Conflict of Interest** Mark Tomlinson is an associate editor at the journal. The remaining authors have no competing interests relevant to the article to disclose.

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