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Research Article

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# An Analysis of Behaviour Change Techniques used in the Care for Child Development Parenting Program

## Abstract

*Care for Child Development* (CCD) is one of several parenting programs implemented in low- and middle-income countries to improve child cognitive development outcomes by increasing responsive stimulation practices in caregivers of young children. Broadly, these programs have been demonstrated to be effective. However, there is markedly little high-quality evidence for the effectiveness of CCD. Despite this, CCD is promoted by UNICEF and the World Health Organisation as an evidence-based program and is implemented in many countries. We conducted a scoping review, including grey literature and a systematic search of published literature, to obtain an overview of the available evidence. We also performed an analysis of two quantitative outcomes, child cognitive development and caregiver behaviour, to investigate their correlation with behaviour change techniques used in CCD program implementation. We found no significant correlation between any behaviour change techniques and child cognitive development outcomes. There was a significant correlation between the techniques of performance and social support, as well as the total number of techniques used, and caregiver behaviour outcomes. This analysis was limited by the quality of reported data available about the program; of 27 total identified papers, only 14 reported quantitative data regarding either child cognitive development or caregiver behaviour change. Inconsistent reporting of this data required us to use a rating system to perform our analysis; we consequently lost specificity. Even those papers that did report quantitative data were subject to methodological flaws; the measures and study designs used did not always inspire confidence in their results. We concluded that CCD is not one single, well-defined program, and that there is an important distinction to be made between CCD-based and CCD-informed programs. The generic *Care for Child Development* Package (2012) is a framework that contains too many gaps to be easily adaptable. Not enough high-quality studies of this program are available to draw concrete conclusions concerning its effectiveness, in whole or in part.

## Introduction

Although 5.2 million children under the age of 5 worldwide died in 2019, almost 50 times that number – close to 250 million children – survived but did not reach their full developmental potential[1,2]. Developmental potential refers to mental development, including cognitive, language, motor, and social-emotional abilities. The degree of this loss of potential is indicated by the difference in children's current development levels and what they would have achieved in a healthier and more nurturing environment. In this nurturing environment, they would have had access to adequate stimulation and nutrition, which promote healthy development[3]. The failure to reach their full developmental potential would translate to an estimated 20% loss in adult productivity[4].

Early childhood, particularly the years from birth to the age of 5, is a critical period of growth and development for children. According to reviews of recent research, healthy inputs such as adequate stimulation and nutrition during these years of life have had positive impacts over the long term[3]. However, parents and health workers in low- and middle-income countries (LMICs) did not believe that mental development started when scientists said it does. The provision of stimulation through play and communication was not common in many LMICs[5,6]. Parents strove to keep children healthy and fed without much understanding about brain development and the importance of communication and play[7]. There was a tendency among caregivers in LMICs to perceive learning and other important skills as being acquired by children after 3 years of age, instead of being developed during infancy. In contrast, neuropsychological evidence supported the need for stimulation from birth[8].

Early childhood development (ECD) interventions include a range of programs that aim to help children reach their full developmental potential. Parenting programs, particularly those centered on the provision of psychosocial stimulation, strive to support caregivers in enabling their children to reach their full abilities by providing them with a nurturing environment. Significant behaviour change is required on behalf of these caregivers to deliver this essential stimulation. These interventions are of such import that attention to ECD and getting all children developmentally on-track has been included in the United Nations (UN) sustainable development goals for 2030[9]. This report presents a well-known ECD program that is used worldwide, *Care for Child Development* (CCD), and analyzes data regarding the behaviour-change techniques used in the implementation of this program. The objective of this program is to help caregivers provide responsive stimulation to their children through play and communication. The effects of the behaviour-change techniques used in CCD to change parental practices are then examined in association with quantitative parent and child outcomes.

### Evidence for the Effectiveness of Parenting Programs

Two recent systematic reviews and meta-analyses provided strong evidence for the impact of stimulation interventions on parenting outcomes and child development in LMICs[10,11]. Aboud & Yousafzai (2015) reviewed 21 interventions that promoted parental stimulation and 18 interventions that aimed to improve nutrition in LMICs. They found a medium effect size for interventions that promoted parental psychosocial stimulation on children's cognitive ($d$=0.42) and language ($d$=0.47) development[10]. On the other hand, the nutrition interventions had a very small effect on cognitive and language development ($d$=0.09).

This meta-analysis makes the case for stimulation-focused parenting interventions. Contrary to the previous literature suggesting that nutrition was critical for children's mental development, this review suggests that its impact is less than that of stimulation[10].

Jeong and colleagues' (2021) global systematic review and meta-analysis evaluated the effectiveness of parenting interventions on child development and parenting outcomes[11]. Although they evaluated programs delivered in both high-income countries and LMICs, the results from LMICs were stronger and more relevant for the current scoping review. Pooled effect sizes for interventions in these environments indicated positive benefits of interventions on children's cognitive ($d$=0.41), language ($d$=0.35), motor ($d$=0.26), and socioemotional ($d$=0.24) development. They also found positive benefits on parenting knowledge ($d$=0.60), parenting practices ($d$=0.47), and parent-child interactions ($d$=0.47). This review highlights the importance of teaching responsive stimulation and providing early learning opportunities for children during parenting programs, especially in LMICs. It also demonstrates that parenting programs for caregivers of children in the first three years of life are overall effective for improving child development and parenting outcomes. Due to the results of these two systematic reviews, and the evidence presented above that there is a knowledge gap for parents and caregivers in LMIC, this review focuses on a parenting program as implemented in LMIC.

CCD is a flexible framework with a few core messages about responsive stimulation, focusing on communication and play. Consequently, the CCD program takes many forms in its various implementations. Most use the materials provided by UNICEF (2012): a manual for delivery agents, counselling cards that function as job aides, notes for trainers of delivery agents, a guide for clinical practice, and a framework for monitoring and evaluation. Because CCD is a framework, it requires not only adaptation to the context but also a great deal of fleshing out the details of what to do and tell parents. Materials for those delivering the program and for their trainers are available[12]. They provide illustrations of how to play and communicate with a child of different ages as well as a sequence of actions for the delivery agent: ask caregivers how they play with their child and listen, praise the caregiver, advise on how to improve and problem-solve. Many of their materials and videos appear to show clinicians delivering the messages to caregivers who arrive at a well-baby clinic. However, it is adaptable to a home or group session. One 24-month CCD program combining home and group formats in Pakistan using community health workers found medium effect sizes on cognition ($d$=0.6), language ($d$=0.7), and motor ($d$=0.5) development at 24 months of age. Children in the intervention group also had statistically significantly higher cognition, language, and motor skills at 4 years of age than the children who had not received the intervention[13].

### Behaviour Change Strategies in ECD Interventions

Parenting programs seeking to guide caregivers' interactions with their children are ultimately aiming to change behaviour. Until recently, parenting programs provided parents solely with information about what children needed and why. They assumed that knowledge would change practices. However, these programs failed to significantly change caregiver behaviour and improve child development outcomes[14]. Social psychologists introduced program developers to theories and techniques of behaviour change[15]. While this helped the field of ECD advance, program developers are less concerned with testing discrete theories of behaviour change than with finding combinations of techniques that prove to be effective[16].

For example, those implementing ECD interventions began to use Bandura's social-cognitive learning theory to change parental practices. Social-cognitive learning theory posits that people learn from each other via observation, imitation, modeling, practice and feedback[17]. This theory, thus, provides explicit suggestions for delivery agents to demonstrate a new practice to caregivers and have them practice with their children. The use of techniques proposed by social-cognitive learning theory was found to translate to greater behaviour change in caregivers[10]. However, ECD intervention trials are not designed to test Bandura's theory. Rather, they are inspired by it.

The 2015 systematic review of stimulation interventions identified techniques of behaviour change used in interventions to see which led to better child outcomes[10]. The effect sizes of child development outcomes were correlated with the presence or absence of each technique. The use of small media was most highly correlated with mental development gains, followed by performance and then problem solving. Unfortunately, problem solving techniques were infrequently used, and social support even less so; thus, no conclusions could be drawn about these techniques. The authors did conclude that the more of these techniques used in an intervention, the greater the effect on child development outcomes. This evidence suggests that the techniques used in an intervention to change parental behaviour can contribute to the success of that program, and that some techniques are associated with better outcomes than others.

The purpose of this study is to examine behaviour change techniques used in the implementation of CCD and how such techniques relate to outcomes. Consequently, the objectives were to conduct a scoping review to identify publications on the implementation of a CCD program in LMIC, examine its effectiveness in improving parent practices and child development, and relate these outcomes to behaviour change techniques used by CCD programs.

## Methods

This study consisted of two parts. First, we conducted a scoping review of the peer-reviewed papers and grey literature reports on CCD. We extracted key information from these reports including evidence for improved parent and child outcomes. Secondly, the extracted data about behaviour change techniques was statistically analysed to see if any techniques were correlated with parent and child outcomes.

### Scoping Review

We conducted a scoping review of the published and unpublished reports of CCD implementation. We extracted information regarding the content and implementation of these programs, including the adaptations made to the CCD package. We also extracted information about the behaviour change techniques that were used by the program.

We chose to conduct a scoping review – "a form of knowledge synthesis that addresses an exploratory research question aimed at mapping key concepts, types of evidence, and gaps in research related to a defined area or field by systematically searching, selecting, and synthesizing knowledge to identify relevant studies"[18]. The aim of such a review is not to answer one specific question, but rather to provide an overview of the evidence available regarding the topic in question[19]. One goal of this project was to summarize published and unpublished reports of CCD implementation by consulting sources beyond published, peer-reviewed, journal articles. Thus, a scoping review was more appropriate than a systematic review to examine our broad and exploratory research question, "how is CCD implemented globally?"

To identify peer-reviewed, published journal articles that detail CCD-interventions, a systematic search of two databases was conducted. MEDLINE and Global Health OVID were searched on November 14, 2021. Search terms were designed to capture the various ways that CCD interventions are named when they are reported ("Care for Child Development," "Care for Development," "early childhood development" AND intervention/program/trial, trial "promoting child development"). From the two databases, a total of 497 papers were identified: 253 papers were identified on MEDLINE and 244 on Global Health OVID. To be included in this review, the articles needed to outline a parenting intervention based on CCD either in whole or in part, to be delivered to caregivers of children aged 0-3 years in a LMIC setting and be available in English. A final number of 18 peer reviewed articles were included. In addition to a search of the databases, we identified relevant papers from published systematic reviews and meta-analyses (n=2)[11]. We also looked for work by known re

searchers who had conducted or collected published and unpublished reports (n=2)[20,21]. As well, we consulted reports written for earlier reviews of CCD (n=3)[22-24]. This allowed us to survey beyond peer-reviewed journal articles. Grey literature was included because the available peer-reviewed literature is limited. CCD is often implemented for purposes other than research, and the information about these implementations is more often available in internal reports and unpublished documents. Furthermore, previous reviews of CCD were not available as peer-reviewed journal articles but do contain a wealth of information. A total of 27 papers were included in this review.

### Data Extraction Process

Data extraction was conducted by all three authors. We began by extracting information from the same papers, and then comparing the data extracted and addressing any inconsistencies. Two of the team members extracted information from different papers, with the third extracting information from overlapping papers to ensure we were consistent in our extraction. The information about the program, its delivery, and its outcomes, as described earlier, was added to an extraction table. The extraction table was designed to report information required by two reporting guidelines: Consolidated Advice on Reporting ECD Implementation Research (CARE) and Consolidated Standards of Reporting Trials (CONSORT)[25,26]. The literature that was reviewed for this review was not all peer-reviewed or published in journals; 18 articles were peer reviewed and 9 were not. The grey literature (n=9) was not expected to conform to rigorous reporting guidelines such as those described above, and some peer-reviewed articles were written before the CARE guidelines were created (n=9). Thus, we were not able to extract information for every column of the extraction table for all sources. This information was then condensed, and is available as Table 1.

#### *Extraction Table Design*

We extracted the information that the CARE guidelines recommend reporting. The CARE guidelines include recommendations to include information about how the program was adapted from its original version, how the workforce was trained and supervised, how attendance and acceptability were assessed, and how fidelity and quality of delivery were assessed. They lay out a strategy for improved reporting of implementation in ECD research[26]. These guidelines are recent and were designed with the improvement of the field in mind, we therefore did not expect all papers to meet the requirements of these guidelines. We also summarized the information required by the CONSORT guidelines. They require information on the beneficiaries and sample size, random assignment to intervention and control groups, the design, measurement of outcomes, blinding of assessors, and findings[25]. They provide direction for the reporting of randomised controlled trials (RCTs) so that readers can assess the trial accurately. Including the CONSORT guidelines in our extraction table allowed us to gauge the relative quality of the included articles.

### Data Analysis

The behaviour change strategies that were employed in an intervention were extracted as part of our data extraction process. The presence of each of five behaviour change techniques noted in the extraction was coded as 0 (not present) or 1 (present) for each paper. It was possible for each program to use multiple techniques. The techniques that were identified were performance [self or other], problem-solving, social support from peers or family, provision of materials, and use of audio-visual or print media. Performance [other] was defined as the use of demonstrations by either the delivery agent or another beneficiary to model a behaviour, while performance [self] was identified as the caregivers practicing a behaviour themselves with their child and receiving feedback or coaching. Both kinds of performance were combined into one technique for our analysis. We identified a program as using the problem-solving technique if the delivery agent helped the beneficiary identify the facilitators and barriers of a given behaviour, as well as solutions to overcome the barriers. Social support was identified if the intervention leveraged the beneficiary's relationship with family members, community members, and resources as sources of support to facilitate behaviour change.

This technique did not have to be included deliberately as part of the program's implementation to be identified, given that social support can often occur as a by-product of group sessions when the beneficiaries start to encourage each other. However, not all interventions using the group session modality were identified as using social support; the report of the program had to include a description of the role of social support in their program and whether it was intentional or not to be identified as using this technique. Interventions providing materials such as books and play objects to their beneficiaries were identified as using the behaviour change technique of material provision, while those using print media such as pamphlets and posters, or audio-visual media such as radio or TV, to convey messages were identified as using the media technique.

The quantitative outcomes of either child cognitive development or caregiver behaviour change were not reported in a consistent way, so we rated each of the outcomes using an effect size *d* if available, or a p-value. The ratings assigned to each outcome were based on the reported outcome of the intervention, including effect size and p-value, and were determined by consensus by two authors (CW and FEA).

## Results

Fourteen of the 27 papers reported their analysis of a quantitative outcome for child cognitive development and/or caregiver parenting behaviour. The quantitative studies included RCTs (n=4), pilot studies (n=5), and pre-post designs (n=5). The remaining sources were mainly qualitative reports on the implementation of the program from beneficiaries' and implementers' perspective. These reports presented very positive feedback overall, but sample sizes were too small for any significant analysis.

### Child Development Outcomes

Thirteen of the 27 analyzed papers reported a child development outcome. Some papers reported more than one quantitative outcome. These included scores on the Bayley Scales of Infant and Toddler Development (BSID-III) (n=2), the Ages and Stages Inventory (ASQ) (n=7), the Malawi Development Assessment Tool (MDAT) (n=4), the INTERGROWTH-21$^{st}$ measure (n=1), and the Early Childhood Development Index (ECDI) (n=1). Direct assessments of the child, such as those using the Bayley, MDAT or INTERGROWTH-21$^{st}$ were of higher quality than a potentially biased parent report (ASQ, ECDI). In some cases, the assessors were not blinded to condition[27]. Of the thirteen articles, ten found at least one significant child outcome and three found no significant child outcome.

To determine the association between behaviour change strategies used and the child outcome, we first categorized the significance of child outcomes. The significance level (p-value) of the outcome was often reported, and sometimes means, standard deviations, and effect sizes were also included. With the information reported, we were not able to calculate an effect size for all the interventions. However, we wanted to determine the relation between the behaviour change techniques employed by a program and an outcome. We therefore assigned an outcome effect rating from 0 to 4 based on significance level or effect size: 0 ($d$<0.10 or $p$>0.10), 1 ($d$=0.10–0.20; or 0.10>$p$>0.05), 2 ($d$=0.21–0.50; or 0.049>$p$>0.01), 3 ($d$=0.51–0.80; or 0.009>$p$>0.001), and 4 ($d$>0.80; or $p$<0.001). The presence of each behaviour change technique noted in the extraction was coded as 0 (not present) or 1 (present) for each paper. The techniques identified were performance [self or other], problem-solving, social support from peers or family, provision of materials, and use of audio-visual or print media.

**Table 1.** Condensed Extraction Tables

*1. Programmatic Features*

| Author, year, country | Delivery modality | Intensity (duration & dosage) | CCD-Based or CCD-informed | Adaptations to CCD reported | CCD Bundled with another package | Behaviour Change techniques |
|---|---|---|---|---|---|---|
| **Ertem et al., 2006, Turkey** | Clinic visits | 2 weeks, 2 weekly sessions | CCD-based | No | Yes; Reach Up and Learn | Performance [other and self] |
| **Jin et al., 2007, China** | Clinic visits | 2 30-60 min sessions, 6 months apart | CCD-based | Yes | Yes; IMCI | Media [print]; performance [self &other]; problem-solving |
| **Ertem 2009 Turkey** | Training of clinic visit delivery agents | Not reported | CCD-based | No | No | No |
| **Engle, Najimidinova, Faromuzova, 2011; Tajikistan, Kyrgyzstan, and Kazakhstan** | Clinic visits | 1 5min session | CCD-based | No | Yes; IMCI | No |
| **Jones, 2012, Mozambique** | Home visits | 3 sessions | CCD-based | No | No | Media [print]; Performance [self] |
| **Lingam, 2014, India and Pakistan** | Home visits | 27 sessions held over two years | CCD-based | No | No | Media [print], performance [self], problem-solving |
| **Thorne 2014, Kenya** | Home visits and group sessions | Not reported | CCD-based | Yes | Yes; health package | No |
| **Yousafzai, 2014, Pakistan** | Home visits and group sessions | 80 min group sessions, 11-30 min home visits conducted monthly for 21.5-24 months for a total of 20 of both. | CCD-based | Yes | Yes; nutrition education package | Materials, performance [self], problem-solving |
| **Holding, 2015, Mali** | Home visits and group sessions | Not reported | CCD-based | Yes | No | Media |
| **PATH, 2015, Mozambique** | Clinic waiting room | A few days per week during morning hours | CCD-informed | Yes | No | Media |
| **Rockers 2016, Zambia** | Home visits and group sessions | Fortnightly home and group sessions delivered for 12 months; total of 20 group sessions and 23 home visits | CCD-informed | Yes | Curriculum included CCD, and Inter-agency Taskforce on HIV and ECD package | Performance [self], social support [peer] |
| **Bayitondere, 2018, Rwanda** | Clinic visits and group sessions | Not reported | CCD-based | No | Yes; PDC | |
| **Fisher 2018, Vietnam** | Home visits and group sessions | 60-90 min group sessions every 2-4 weeks for 18 months (total of 19). One 45-60 min home visit during first 8 weeks postpartum | CCD-based | Yes | Yes; many | No |
| **Gladstone, 2018, Malawi** | Home visits and group sessions | 2 45 minute group sessions and 2 30 minute home visits per month for six months. | CCD-based | No | Yes; Children's Health Growth and Development training materials | Materials, Media [AV and print], Social Support [family and community], performance [self, other], problem-solving |
| **Lynch, 2018, Malawi** | Home visits | 60 min long session every 2 weeks for 6 months; 12 sessions total | CCD-based | Yes | Yes; many | Materials, Media [print], performance [other] |
| **UNICEF, 2019, Paraguay** | Home visits and group sessions | Not specified | CCD-based | Yes | No | Performance [other and self], Social support [family] |

**Table 1.** Condensed Extraction Tables (contd.)

*1. Programmatic Features (contd.)*

| | | | | | | |
|---|---|---|---|---|---|---|
| **Rosales, 2019, Armenia** | Home visits and group sessions | 4 group sessions for mothers over 14 months, 1 for fathers and 1 for grandmothers | CCD-informed | Yes | Yes; WV Armenia's maternal, newborn, and child health program | Performance [self], Materials, Social Support [Family] |
| **Zhou, 2019, China** | Group sessions | 3+ available per month for 2 years | CCD-based | No | No | Materials |
| **Barnhart, 2020, Rwanda** | Home visits | 60-90 minute visits weekly for 3-4 months; 12 sessions | CCD-informed | Yes | Yes; many | Performance, Problem solving, Social support |
| **Betancourt et al., 2020 BMC, Rwanda** | Home visits | 15-22 sessions in 4-8 months | CCD-informed | Yes | Yes; many | Performance [other and self], materials, problem-solving |
| **Rao 2020, Bhutan** | Group sessions at a clinic | Not reported | CCD-based | No | Yes; with health incl. immunization, growth monitoring, developmental screening | No |
| **Shah 2020, India** | Clinic waiting room | 1 10min session | CCD-informed | Yes | Yes; many | Performance [other and self], Materials |
| **Shi 2020, China** | Clinic visits, telephone support | 2 120min clinic visits, one at age 2mo and the next at 6mo. Telephone not specified | CCD-informed | Yes | Yes; "The Best Start for Children aged 0-3 Years" and "Early Childhood Education Program for Chinese Children" | Media [print] |
| **Xu 2020, China** | Group sessions | 42 possible sessions over 24 months | CCD-informed | No | Yes | No |
| **Akhmadi 2021, Indonesia** | Training of delivery agents | 2 days of training for a total of 10 hours | CCD-based | No | No | No |
| **Dovel 2021, Malawi** | Group sessions at a clinic during wait times | 8-24 sessions over 24 months; aligned with ART refill schedules | CCD-based | Yes | No | Social Support [peers] |
| **Jensen et al. 2021** | Home visits | 12 60 min weekly sessions over 3 months, plus 2 120 min booster sessions 3 and 6 months after | CCD-informed | Yes | Yes; adapted from initial intervention with HIV-affected families | Performance [self], Social support [peer and family], problem-solving |

*2. Delivery Agents*

| **Author, year, country** | **Delivery Agents: Sex, Background, Compensation** | **Training: Duration, Trainers, Refreshers, Outcome Evaluation** | **Supervision, Monitoring, Mentoring** | **Integration** |
|---|---|---|---|---|
| **Ertem et al., 2006, Turkey** | Professional: Pediatricians at Ankara School of Medicine | Not reported | Researcher monitored clinic visit using Physician Counseling Skills Scale. | Integrated into pediatricians' responsibilities. Structured CDI interview performed after reason for visit was addressed |
| **Jin et al., 2007, China** | Professional: Health professional at a clinic | Trained in 4-step communication | Not reported | Performed by a health professional at a clinic. |
| **Ertem 2009 Turkey** | Professional: Health professionals (GPs, nurse-midwives); 90% women; 5 years' experience as health providers | Trained 3 days by 6 academics; Outcome evaluation w/ "Knowledge on Child Development" 30-items Pre<Post; Perceived Competence 25 items Pre<Post, rated as they delivered program | Questionnaire completed by trainees 1 year later found that 12% (midwives) were practising; health system barriers to continued implementation | Integrated into health system; received salary; GPs work in clinics; nurse-midwives do home visits |
| **Engle, Najimidinova, Faromuzova, 2011; Tajikistan, Kyrgyzstan, and Kazakhstan** | Professionals: Clinic health workers (nurses, pediatricians); Paraprofessionals: Community health workers Volunteers: Volunteers in Tajikistan; M, F | Within-country variation, some a few hours with no clinical practice; Kazakhstan 5 days with guided practice; Tajikistan 3 days with 2hrs practice; Kyrgyzstan 8 hrs with 4hrs practical practice | Kazakhstan & Kyrgyzstan: Trained workers gave 66% more messages on CCD than untrained. Trained no more likely to demonstrate or give mother chance to practice. | Yes, integrated into health system |
| **Jones 2012, Mozambique** | Facilitators from agriculture, health, and education backgrounds | 2 days training | Facilitators conducting the home visits with mothers and infants were observed directly by researchers | Not specified; program run by Aga Khan foundation |
| **Lingam, 2014, India & Pakistan** | Not reported | Not reported | Not reported | Not reported |

**Table 1.** Condensed Extraction Tables (contd.)

*2. Delivery Agents (contd.)*

| | | | | |
|---|---|---|---|---|
| **Thorne 2014, Kenya (part of AKDN 5-country review)** | Volunteer: Community health workers; At most education is high-school leaving certificate | Counsellors trained 4-5 days (insufficient); practice available to some; Trainers were Community Health Extension Workers (paid staff) who got 2 weeks' training (1 week CCD; 1 week practice training) | 4x yearly Refresher course and monthly meeting by CHW; 1-time on-the-job supervision by CHEW, some peer support by working in pairs. | Yes, health |
| **Yousafzai et al. 2014 Pakistan** | Paraprofessional: Lady Health workers; Female; $85/month paid by government | 3 days for responsive stim package; Trainers had Bachelor's recruited and paid by researchers; Trainers trained for 3 months; Refreshers every 6 months | Supervisors same background as trainers; train, supervise, monitor, mentor LHWs on-the-job; supervision & coaching 2x per month. Supervisors observed & rated home & group sessions. | Yes; CCD intervention integrated into the LHWs' job in the health system |
| **Holding, 2015, Mali** | Professional: Social workers and community workers | Multi country Training of Trainers on CCD, delivery agents monitored through videotape | Not reported | Yes, delivery agents delivered CCD as part of their pre-existing roles |
| **PATH 2015, Mozambique** | Volunteer: Community activists | Not reported | Not reported | Yes, integrated into the health system (delivered in clinic waiting room) |
| **Rockers 2016, Zambia** | Volunteer: Group sessions delivered by 'head mothers' who were selected by the communities; Paraprofessional: Child development agents delivered the home visit component | Head Mothers were trained by Child Development Agents ahead of each session. CDA were trained for 5 days. | CDAs provided resources for 'head mothers' before each group session; monitored attendance at group sessions; completed forms on own home visits | No. CDAs were employed full-time by the project. 'Head mothers' were volunteers from the community |
| **Bayitondere, 2018, Rwanda** | Paraprofessional: Community health workers | Not reported | Not reported | Yes, integrated into the health system |
| **Fisher 2018, Vietnam** | Paraprofessional: Members of local women's union with experience conducting community programmes; Community health workers and kindergarten teachers sometimes co-facilitated. | Trained at the start of each module; 20 times. | Not reported | Women's Union is a highly structured national social organisation; integrated into this organisation |
| **Gladstone, 2018, Malawi** | Health Surveillance Assistants (HSAs), who already had 12 weeks training | Training materials from "Caring for the Child's Healthy Growth and Development" were used. Trainers were from the Ministry of Health and Nutrition | HSAs filled out a data collection form. RAs visited two groups and two individual sessions for HSAs to ensure fidelity & data collection. | Yes, integrated into HSA's pre-existing roles |
| **Lynch, 2018, Malawi** | Professionals:<br>14 community workers, including child protection officers, specialist teachers, and community-based rehabilitation workers; allowance of USD $4.20 per visit | 3 days training, trainers not reported | Community workers used a logbook. RA checked logs, also visited families and collected data. | Not integrated |
| **UNICEF, 2019, Paraguay** | Professional, paraprofessional: "Backpack teachers" do home visits as well as municipal-level community volunteers; M&F | 362 master trainers, workforce, and officials trained; Backpack Teachers given 1 day training | Not reported | Yes, "Backpack Teachers" integrated into education sector. Other delivery agents are community volunteers and so not integrated |
| **Rosales, 2019, Armenia** | Volunteer, Professional: Facilitators who were community active, educated women, social workers, and nurses<br>Professional: Healthcare professionals | Master trainers from WorldVision (WV) trained ECD experts who then trained the facilitators. WV, Ministry of Health, and ECD experts were trained by external consultant on screening and assessment tools, then trained professionals | Reported "supportive supervision for facilitators" i.e. feedback on performance during clinic visits | Integrated into healthcare system: Primary healthcare providers who parents saw for well-child visits integrated ECD counselling, screening, assessment, and referrals into their services. |
| **Zhou, 2019, China** | Volunteer: Volunteers needed at least 8 years of education. | Volunteers were trained by professionals, duration not reported. | Bimonthly supervision. | Not integrated |
| **Barnhart, 2020, Rwanda** | Volunteer: Community-based literate volunteers nominated by chief and elected by the community. Compensated for communication, transport to homes,<br>3hr work per day visiting. | 2 weeks of training, two group meetings as continuous training. | Fidelity assessed by supervisors who listened to audio recording of the delivered sessions; Feedback by phone. Two in-person observations of delivery. | Integrated into social protection system: Community volunteers are part of gov't system and beneficiaries are eligible for Government social protection system (cash for work). |

**Table 1.** Condensed Extraction Tables (contd.)

*2. Delivery Agents (contd.)*

| | | | | |
|---|---|---|---|---|
| **Betancourt, 2020, Rwanda** | Paraprofessionals: "Coaches", 3M & 1F; hired by researchers | 2 weeks; Trained by researchers; Training included role-plays and active practice; | Programme managers conducted observational monitoring and feedback. Weekly phone supervision by researchers, graduate-level ECD expert supervisor, PhD psychologist. | No |
| **Rao 2020, Bhutan** | Paraprofessional: Health Assistants w/ ideal minimum education Secondary 12, some below this | Not Reported | Supervision by health officers with university degree | Yes, Health Assistants in clinics do other health-related work |
| **Shah 2020, India** | Professional: Pediatrician, Physical therapist, Research assistant | 2 days (8 hours); active learning methods: demonstration, practice, role plays, discussion; reached 85% on Fidelity Checklist during practice | Not reported | Yes, integrated into health system (immunization clinics) |
| **Shi 2020, China** | Professional: Child development experts delivered the 2 clinic sessions; compensated allowances were US$130.23 per parenting training session | Not reported | Staff in the Department of Child Healthcare in community health center at Zhanlanlu Hospital were responsible for "supervising and managing" the intervention | Yes, integrated into the health system |
| **Xu 2020, China** | Health and family planning personnel, female caregivers, kindergarten teachers. Progressive increase salary = 450 RMB each month. | 2 weeks training; "Skills to promote positive relationships and a warm environment" | Ongoing training to answer FAQ. | Not integrated |
| **Akhmadi 2021, Indonesia** | Volunteer: Community health workers (F) called "cadres"; Education 70% Junior high (gr 9), 30% senior high; average 10 year experience as cadres; not paid | Training duration 2 days/10 hrs for intervention (n=69); 1 day/5 hrs for controls (n=53); Trainers were Nurses with Masters/PhD; "Caregiver Knowledge of Child Development (2007)" 20 items: Int = Ctrl. Both increased from Pre to Post but scores <14 out of 40; Attitude: Int>Ctrl p=.05; Efficacy, confidence to deliver messages to caregivers: Int=Ctrl. | Supervised by nurses at PHC clinic. | Yes, integrated into health system. Cadres work in community clinics. |
| **Dovel 2021, Malawi** | Volunteer: Expert Clients (EC) HIV-positive volunteer community members who provide counselling and support to HIV-positive individuals | 2 weeks | Once two ECs from each facility were trained, they were then responsible for ECD implementation at their facilities | Yes, integrated into the health system (Anti-Retroviral medication therapy); session conducted while mothers wait for medication |
| **Jensen et al. 2021** | Volunteer: Selected from the local community using a three-step process | 3 weeks (120 hours); role-play-based learning, active coaching practice; trained by researchers and graduate-level experts | Supervisors were graduate-level experts trained by researcher; Weekly phone supervision, monthly group refreshers, weekly peer support groups. Fidelity assessed by supervisors who listened to audio recording of the delivered sessions; Feedback by phone. Two in-person observations of delivery. | Not integrated |

**Table 1.** Condensed Extraction Tables (contd.)

*3. Outcomes for Sources (n=14) that reported a quantitative outcome*

| References | Country<br>HDI | Child Outcome | Caregiver Behaviour Outcome | Ratings | |
|---|---|---|---|---|---|
| | | | | Child | Caregiver |
| **Ertem et al., 2006** | Turkey<br>0.820 | Not Reported | Increase the prop. of participants with HOME scores greater than or equal to 38. | 0 | 1 |
| **Jin et al., 2007** | China<br>0.761 | DQ gains d=0.27 | | 2 | 2 |
| **Engle et al. 2011** | Tajikistan<br>0.668<br>Kazakhstan<br>0.825<br>Kyrgyzstan<br>0.697 | ASQ measure strongest in Tajikistan. Intervention>control on Gross motor (p=.009), Communication (p=.03), Problem solving, fine motor, personal-social ns | Family Care Indicators (FCI): ns | 1 | 0 |
| **Yousafzai et al., 2014** | Pakistan<br>0.557 | BSID-III *d*= 0.6 for cognition, 0.7 for language, 0.5 for motor development at 24mo of age. | HOME *d*=0.86 | 3 | 4 |
| **Rockers et al., 2016** | Zambia<br>0.584 | INTERGROWTH-21 = 0.11 | Reports positive impact on caregiver behaviour | 1 | 1 |
| **Gladstone, 2018** | Malawi<br>0.483 | Change in MDAT: Gross motor= 0.53, fine motor=0.89, language=1.89, social=0.97. | Change in FCI: Availability of play things=1.52, reported interaction with children=0.53 | 2 | 2 |
| **Rosales, 2019** | Armenia<br>0.776 | BSID-III<br>Cognitive scale: d=0.22<br>Language scale: d= 0.17<br>Motor scale: d= 0.17 | Reports that parents from intervention communities demonstrated better support for learning compared to control sites | 2 | 2 |
| **Zhou, 2019** | China<br>0.761 | ASQ adjusted odds ratio of suspected delay 0.69 p<.005, Intv 18% drop; Ctrl 10% drop, esp among children 12-24 m | | 3 | |
| **Betancourt, 2020 BMC** | Rwanda<br>0.543 | MDAT ns<br>ASQ ns | HOME intervention M (SD) pre-23.73 (5.29) to post- 26.02 (3.59) to follow up-27.34 (4.48) p<.05,<br><br>OMCI M(SD) ns | 0 | 1 |
| **Barnhart 2020** | Rwanda<br>0.543 | MDAT ns<br>ASQ ns | HOME M(SD): Post Interv. *d*=1.45;<br>FU *d*=0.87<br><br>MICS M(SD): Post Interv *d*=0.55;<br>FU *d*=1.00 | 0 | 4 |
| **Rao, 2020** | Bhutan<br>0.654 | ECDI those who did vs not participate in C4CD b-.068, SE.032, p<.035 | | 2 | |
| **Shah, 2020** | India<br>0.645 | | Items from MICS<br>p <.05 for; look at picture book, told stories, play.<br>p<.01 for; sing, took out of home, name/count | | 3 |
| **Shi, 2020** | China<br>0.761 | Overall ASQ *d*= 0.58 | | 3 | |
| **Jensen et al., 2021** | Rwanda<br>0.543 | ASQ Gross motor: Post d=0.136;<br>Follow-up d=0.14<br><br>MDAT Gross motor:<br>Post d=-0.02;<br>Follow up d=-0.02;<br><br>ASQ Fine Motor: Post d=0.14;<br>Follow up d=0.00<br><br>ASQ Communication: Post d =0.18;<br>Follow Up d=0.13<br><br>MDAT Language<br>Post d= 0.05;<br>Follow Up d=0.05<br><br>ASQ Prob-Solv: Post d=0.24;<br>Follow Up d= 0.13<br><br>ASQ Social-Emotional:<br>Post d= 0.19;<br>Follow Up d=0.06<br><br>MDAT all ns (see above) | | 1 | |

Child outcomes were analyzed in relation to behaviour change techniques used by the program. Table 2 shows statistics for the Human Development Index of the countries, the behaviour change techniques used by the programs, the total number of these techniques, and the rating of the child cognitive development outcome. To control for the relative development of the countries that the programs were implemented in, the Human Development Index (HDI) was also included in our analysis. The Human-Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and having a decent standard of living[28].

Higher means for behaviour change techniques implied more frequent use. Performance (self and other combined) was the most common behaviour change technique for these programs, followed by problem solving, materials, and finally media and social support. Programs used less than two techniques on average ($M$=1.846). The mean rating for child development outcomes was 1.54, a rating corresponding to a point between a small and a medium effect size.

**Table 2.** Statistics for Reported Child Development Outcomes and Behaviour Change Techniques

| Variable | Mean | Std Dev | Minimum | Maximum |
|---|---|---|---|---|
| HDI | 0.65 | 0.12 | 0.48 | 0.82 |
| Performance | 0.62 | 0.51 | 0 | 1 |
| Problem Solving | 0.46 | 0.52 | 0 | 1 |
| Materials | 0.31 | 0.48 | 0 | 1 |
| Media | 0.231 | 0.44 | 0 | 1 |
| Total # of Techniques | 1.85 | 1.28 | 0 | 4 |
| Child Outcome (rating) | 1.54 | 1.13 | 0 | 3 |

Table 3 presents the correlations between child outcomes and behaviour change techniques. Given the small sample size, we used $p$<0.10 as the threshold for significance. No significant correlations were found between the reported child development outcome and the behaviour change technique(s) employed by the program.

**Table 3.** Pearson Correlation and p-Values for Child Development Outcomes and Behaviour Change Techniques

| Variable | Correlation r (p) |
|---|---|
| HDI | 0.25 (0.42) |
| Performance | -0.34 (0.26) |
| Problem Solving | -0.18 (0.57) |
| Social Support | 0.07 (0.83) |
| Materials | 0.28 (0.35) |
| Media | 0.23 (0.44) |
| Total # of Techniques | 0.00 (0.99) |

## Caregiver Behavioural Outcomes

Ten of the 27 papers analyzed a quantitative caregiver behaviour outcome. The measures for these outcomes included the Home Observation Measurement of the Environment (HOME) (n=4), the Family Care Indicators (FCI) (n=2), Observations of Mother-Child Interactions (OMCI) (n=1), and the Multiple Indicator Cluster Survey (MICS) of parenting practices (n=1). These measures all assess parenting practices related to provision of psychosocial stimulation for the child, such as play materials, play activities, and responsive interactions. In some studies, the information reported was insufficient to calculate an effect size, so ratings were assigned on the same scale as the child development outcomes.

The presence or absence of each behaviour change technique was once again coded as 0 if absent and 1 if present. For these papers, performance [self and other] was once again the most common behaviour change technique, followed by problem solving, materials, social support, and finally media (see Table 4). On average, programs used slightly more than two techniques ($M$=2.20). The mean rating for the parent behaviour change outcome was 2.00, corresponding to a small to medium effect size ($d$=0.20-0.50).

We considered p-values less than 0.10 as significant due to the small sample size (see Table 5). The strongest correlation was between the total number of behaviour change techniques used and the caregiver behaviour change outcome ($r$=0.75, $p$<0.02). Social support ($r$=0.69, $p$<0.03) and performance ($r$=0.59, $p$<0.08) were the two specific techniques related to parental outcomes.

**Table 4.** Statistics for Reported Caregiver Behaviour Change Outcomes and Behaviour Change Techniques

| Variable | Mean | Std Dev | Minimum | Maximum |
|---|---|---|---|---|
| HDI | 0.64 | 0.12 | 0.48 | 0.82 |
| Performance | 0.80 | 0.42 | 0 | 1 |
| Problem Solving | 0.50 | 0.53 | 0 | 1 |
| Social Support | 0.30 | 0.48 | 0 | 1 |
| Materials | 0.40 | 0.52 | 0 | 1 |
| Media | 0.20 | 0.42 | 0 | 1 |
| Total # of Techniques | 2.20 | 1.23 | 0 | 4 |
| Parent Outcome (rating) | 2.00 | 1.33 | 0 | 4 |

**Table 5.** Pearson Correlation and p-Values for Caregiver Behaviour Change Outcomes

| Variable | Correlation r (p) |
|---|---|
| HDI | -0.31 (0.39) |
| Performance | 0.59 (0.07) |
| Problem Solving | 0.47 (0.17) |
| Social Support | 0.69 (0.03) |
| Materials | 0.32 (0.36) |
| Media | -0.20 (0.58) |
| Total # of Techniques | 0.75 (0.01) |

## Discussion

The goals of this review were twofold. Firstly, we conducted a scoping review to overview the global implementation of CCD. Secondly, we examined the behaviour techniques used in the implementation of CCD for a correlation with both child cognitive development and caregiver behaviour change outcomes. We found no significant correlations between behaviour change techniques and child cognitive development outcomes; however, parental behaviour changes were associated with the techniques of performance, social support, as well as the total number of techniques employed by an intervention.

The correlations with parental behaviour change support the claim made by others that the techniques of behaviour change employed by a program influence the outcomes[10]. The lack of correlation between child development outcomes and behaviour change techniques is inconsistent with this claim. This suggests that CCD implementation of these techniques may be inadequate to improve child outcomes. It could also be due to low sensitivity and bias inherent in parent-report measures of child development, such as the ASQ-III, used as a measure in five of the 13 studies reporting on child development outcomes. The results of this study support the use of the techniques of performance [self and other], social support, as well as an increase in the total number of behaviour change techniques, in further implementation of CCD.

## Conclusion

Programs derived from the *Care for Child Development* package are very variable. The available evidence about their effectiveness is based on low quality research and shows weak impacts. However, it must be noted that it is inherently difficult to conduct research on an unstructured program such as this one. Of the 27 studies identified in our scoping review, only 14 reported effectiveness statistics with regards to child development and/or caregiver behaviour outcomes. Using the available evidence, we determined that caregiver behaviour outcomes were correlated with the behaviour change techniques of performance and social support, as well as the total number of behaviour change techniques used in the intervention. These techniques should be used in future implementation of CCD. We did not find evidence that behaviour change techniques used had a significant impact on the child development outcomes reported. We believe that this lack of effect is not proof that behaviour change techniques cannot influence such outcomes. Instead, it supports the idea that implementation of these techniques is not sufficient, or too variable, to impact child cognitive development. Furthermore, some of the measures used to quantify child cognitive development are subject to bias, most clearly in the case of those that depend on parental report.

One of the most interesting questions about the CCD package is whether its flexible nature is a strength or a weakness. Because it isn't a prescribed program, it can be implemented in a way that matches a cultural context. LMIC are varied, and such adaptability is vastly preferable to a "one size fits all" approach. However, the cost of a flexible program is that it requires expert assistance to be implemented. CCD does not contain enough information to be implemented by anyone. Therefore, despite its adaptability, it cannot be implemented anywhere. More randomized controlled trials that use valid measures should be conducted in order to make claims that CCD is "evidence based." Furthermore, to improve the package globally, a venue for those who have experience implementing CCD to share their expertise with those just starting out would be a huge asset. As of now, the program's adaptability comes at the cost of a need for technical support from UNICEF and/or child development experts.

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## References

1. Lu, C., Black, M. & Richter, L. M. 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 Glob. Health 4, e916-e922 (2016).

2. Sharrow, D., Hug, L., Liu, Y. & You, D. Levels and Trends in Child Mortion, New York, 2020).

3. Britto, P. R. et al. Nurturing Care: Promoting early childhood development. Lancet 389, 91-102 (2017).

4. World Health Organisation. Improving Early Childhood Development: WHO guideline (World Health Organisation, Geneva, 2020).

5. Bornstein, M. H. & Putnick, D. L. Cognitive and Socioemotional Caregiving in Developing Countries. Child Dev. 83, 46-61 (2012).

6. Bornstein, M. H., Putnick, D. L. & Lansford, J. E., Deater-Deckard, K. & Bradley, R. H. A Developmental Analysis of Caregiving Modalities Across Infancy in 38 Low- and Middle-Income Countries. Child Dev. 86, 1571-1587 (2015).

7. Lindland, E. et al. Expanding the Basics: Mapping the Gaps between Expert, Decision-Maker and Public Understandings of Early Childhood Development in Kenya (FrameWorks, 2018).

8. Fox, S. E., Levitt, P. & Nelson, C. A. How the timing and quality of early experiences influence the development of brain architecture. Child Dev. 81, 28-40 (2010).

9. United Nations. Transforming Our World: The 2030 Agenda for Sustainable Development (2015); https://sdgs.un.org/2030agenda

10. Aboud, F. E. & Yousafzai, A. K. Global Health and Development in Early Childhood. Annu. Rev. Psychol. 66, 433-457 (2015).

11. Jeong, J., Franchett, E. E., Ramos de Oliveira, C. V., Rehmani, K. & Yousafzai, A. K. Parenting Interventions to Promote Early Child Development in the First Three Years of Life: A global systematic review and meta-analysis. PLoS Med. 18, e1003602, (2021).

12. UNICEF. Care for Child Development (2012); https://www.unicef.org/documents/care-child-development

13. Yousafzai, A. K., Rasheed, M. A., Rizvi, A., Armstrong, R. & Bhutta, Z. A. 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-randomised factorial effectiveness trial. Lancet 384, 1282-1293 (2014).

14. Aboud, F. E. Evaluation of an Early Childhood Parenting Programme in Rural Bangladesh. J. Health Popul. Nutr. 25, 3-13 (2007).

15. Glanz, K. & Bishop, D. B. The Role of Behavioral Science Theory in Development and Implementation of Public Health Interventions. Annu. Rev. Pub. Health 31, 399-418 (2010).

16. Briscoe, C. & Aboud, F. Behaviour Change Communication Targeting Four Health Behaviours in Developing Countries: A review of change

techniques. Soc. Sci. Med. 75, 612-621 (2012).

17. Bandura, A. Social foundations of thought and action: A social cognitive theory. (Prentice-Hall, 1986).

18. Colquhoun, H. L. et al. Scoping Reviews: Time for Clarity in Definition, Methods, and Reporting. J. Clin. Epidemiol. 67, 1291-1294 (2014).

19. Munn, Z. et al. Systematic Review or Scoping Review? Guidance for authors when choosing between a systematic or scoping review approach. BMC Med. Res. Methodol. 18, 143 (2018).

20. Karuskina-Drivdale, S., Kawakyu, N. & Mulhanga., F. A Playbox Intervention in Health Facility Waiting Rooms in Mozambique: improving caregivers' knowledge, skills, and communication with health professionals. Int. J. Birth Parent Educ. 6 (2019).

21. Rosales, A. et al. Behavior Change Communication Model Enhancing Parental Practices For Improved Early Childhood Growth And Development Outcomes In Rural Armenia: A quasi-experimental study. Prev. Med. Rep. 14, 100820 (2019).

22. Lucas, J. E., Richter, L. M. & Daelmans, B. Care For Child Development: An intervention in support of responsive caregiving and early child development. Child Care Health Dev. 44, 41-49 (2018).

23. Philbrick, W. C., Patel Priya C. & Yousafzai A. Care for Child Development (CCD): An approach to enhance nurturing care in the XXI Century. (Harvard School of Public Health, UNICEF, RTI International; Tanzania, 2017).

24. Thorne, C. Care For Child Development in Five Countries. (Aga Khan Foundation, 2014).

25. Schulz, K. F., Altman, D. G. & Moher, D. CONSORT 2010 Statement: Updated guidelines for reporting parallel group randomised trials. BMJ 340, c332 (2010).

26. Yousafzai, A. K., Aboud, F. E., Nores, M. & Kaur, R. Reporting Guidelines for Implementation Research On Nurturing Care Interventions Designed To Promote Early Childhood Development. Ann. N. Y. Acad. Sci. 1419, 26-37 (2018).

27. Jin, X. et al. "Care for Development" Intervention In Rural China: A prospective follow-up study. J. Dev. Behav. Pediatr. 28, 213-218 (2007).

28. United Nations Development Programme. Human Development Index (2020); http://hdr.undp.org/en/content/human-development-index-hdi

29. Easthall, C., Song, F. & Bhattacharya, D. A Meta-Analysis of Cognitive-Based Behaviour Change Techniques As Interventions to Improve Medication Adherence. BMJ Open 3, (2013).