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A Systematic Review of Caregiver Interventions in Infancy to Enable Responsive Caregiving and Secure Attachment in Low and Middle-Income Countries.

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Abstract

The first 1000 days is recognised as the most sensitive period of development of an individual's life. Infants in low and middle-income countries face significant risks to their development during this period. Research confirms that having a responsive, caring relationship between the infant and caregiver is a considerable protective factor for infants, and results in better long-term outcomes in cognition, language, academic achievement, social skills and behaviour. The aim of this review was to systematically examine the literature to identify interventions in low and middle-income settings that influence infant-caregiver responsiveness and attachment and explore the characteristics of the interventions that contribute to its efficacy. Ten electronic databases were searched (Pubmed, Scopus, PsycINFO, PsycARTICLES, Africa-Wide, CINAHL, Health Source, ERIC, SocINDEX & Cochrane Library), as well as hand searching relevant reference lists for published articles in the English language from 1969-2018. A total of 11 765 studies were identified through the search strategy and 24 studies were included in the review. The included studies were critically appraised and then coded descriptively to enable a narrative synthesis of findings. Studies were from low and middle-income countries in Africa, Asia, Europe and South America and consisted predominantly of randomized control trials, but also quasi-experimental studies and a single cohort and qualitative study were included. All but two studies found positive effects on responsiveness, attachment or both. For ten of the studies this effect was significant. The findings suggest implementing individual or group interventions in LMICS has a positive effect on caregiver-infant relationships and can be delivered successfully by trained non-professional staff.

Key words: Parenting, responsive caregiving, attachment, caregiver sensitivity and low and middle-income countries

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Part A: Review Protocol

A Systematic Review of Caregiver Interventions in Infancy to Enable Responsive Caregiving and Secure Attachment in Low and Middle-Income Countries.

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Background to the Protocol

The Western Cape Department of Health (WCDOH) recognises that the First 1000 days (conception to age 2) is a key period of sensitivity in child development where children's longer-term outcomes can be affected positively. The right care, nutrition and healthcare can ensure that infants turn into productive citizens who achieve their potential (WCDOH, 2017). Globally there has been a drive towards investing in the First 1000 days, which has been detailed in a series of articles in the Lancet in 2007, 2011, 2013 and 2016 (The Lancet, 2016; Black et al., 2013; The Lancet, 2007; The Lancet, 2011), as well as in "The Global Strategy for Women's, Children's and Adolescent Health (2016-2030)" produced by Executive Office of the United Nations Secretary-General and the WHO (Every Woman Every Child, 2015).

In the Western Cape there are currently many infants who are at considerable risk of not achieving their developmental potential. The prevalence of Foetal Alcohol Syndrome is the highest in the country in some areas of the province (Olivier et al., 2016). There are many social risk factors for poor health outcomes in children, such as caregiver unemployment, inadequate housing, mental illness and low income (Malek, 2017b). In response to these risks the province has devised a strategy aimed at "increas[ing] wellness, safety and tackl[ing] social ills" and having "Safe and healthy children" (Malek, 2017a; Western Cape Government, 2015).

The provincial Department of Health (DOH) has reviewed research conducted at the Harvard University Center on the Developing Child and has identified what is required for optimum development (Center on the Developing Child at Harvard University, 2017; Malek, 2017a). Based on the Harvard research the Western Cape Department of Health has devised goals including:

“Mothers/Caregivers in 1st 1000 Days are cared for, nurtured and empowered to raise children who are happy, curious and resilient and maximise their full potential for development of the wider community” (WCDOH, ND)

and

“There is a nurturing, stable, responsive, consistent, loving relationship, between caregiver (incl.mother, father, and grandparent) and child.”

To achieve these goals the province has adopted a conceptual model, a key aspect of which is:

“Thrive: Child and mother realizing their full physical, cognitive/mental and social potential, through the absence of illness, appropriate nutrition and a nurturing environment” (Western Cape Government, 2015).

With the research and goals in mind the Perinatal Task Team at the WCDOH undertook a rapid situation analysis of current policy and interventions in the province to support responsive caregiving and it was found that there was limited focus on interventions to support caregiving relationships (Malek, 2017a). The department has responded to this deficit by commissioning students to undertake systematic reviews that could assess the efficacy of interventions to support the First 1000 days initiative with a view to identifying potential interventions to be implemented in the province.

This review aims to look specifically at interventions for caregivers that are undertaken in low and middle-income countries to enable responsive caregiving and infant attachment. It considers the factors that contribute to the success and challenges to interventions in these settings, with a view to understanding whether such interventions could be implemented in the Western Cape context

Introduction

“Stable, caring, interactive relationships with adults – any way or any place they can be provided – will benefit healthy brain development of young children. Conversely, adverse early experiences – eg, unstable caregiving, deprivation of love or nutrition, and stresses associated with neglect and maltreatment – greatly increase the likelihood of poor health and development across the entire life course.” (WHO, 2017)

Many infants in low and middle-income countries (LMICs) are at considerable risk of not achieving their developmental potential due to their exposure to poverty, violence, malnutrition, infectious diseases and challenging home environments (Engle et al., 2011b; Lucas et al., 2018; Richter et al., 2017; Lu et al., 2016; Grantham-McGregor et al., 2007b). All these factors influence the development and functioning of the young brain (Luby et al., 2013; Walker et al., 2011). Children in deprived circumstances have different brain structure and function, as well as altered genetic expression when compared to children who do not grow up in deprived contexts (Asok et al., 2013; Luby et al., 2013). Neuroimaging studies have confirmed that responsive caregiving can mitigate these risks (Luby et al., 2013; Shonkoff et al., 2016) and moderate the effect early life stress has on brain development (Asok et al., 2013; Black et al., 2017; Fearon et al., 2017). Responsive caregiving has also been linked to positive outcomes such as improved cognition and language, school achievement, better social skills and fewer behaviour problems (Eshel et al., 2006a).

Recent advances in neuroscience have significantly enhanced understanding of the extent to which the infant brain rapidly develops in the first two years of life (Richter et al., 2017; Luby, 2015; Black et al., 2017) with thousands of new synapses developing every minute in response to an infant’s environment (Grantham-Mcgregor et al., 2014; Shonkoff et al., 2016; WHO, 1999). At this period of rapid development the brain is more sensitive to environmental stimuli,

both positive and negative (Johnson et al., 2016). This early period of neuroplasticity presents a window of opportunity to ensure optimum brain development through evidence based interventions that support caregivers to provide a nurturing relationships and environments for infants (Engle et al., 2011b; Shonkoff et al., 2016).

In the early years of life, the infant's environment consists predominantly of the caregiver. Unlike other mammals, the human infant never exists independently of the caregiver (Bornstein, 2002; Murray, 2000), and the caregiver has considerable influence on the infant's survival and development (WHO, 2004; Oates, 2007). Whilst infants are entirely dependent on their caregiver and lack skills such as clear verbal communication, they do have the ability to get responses from caregivers through being visually appealing and making eye contact and sounds (Phillips and Shonkoff, 2000; Isaeva and Volkova, 2016; Bornstein et al., 2012b). Neuroimaging studies have shown that infants by their very appearance activate the adult limbic system which motivates adults to care for them (Feldman, 2015) and respond with affection, vocalisations and meeting of their physical needs. Even the youngest infant is socially orientated and will show gaze preference for human faces rather than any other objects and is able to discern their caregiver over other people very soon after birth (Murray, 2000). This orientation towards the caregiver is very necessary as the infant needs the caregiver to respond appropriately to their needs so that they may survive and flourish. For this communication between caregiver and infant to be successful there needs to be an adequate match between the infant's communication and the caregiver's response (Feldman, 2015).

When the infant is consistently responded to and its needs are met, the infant feels secure. When caregivers respond appropriately they can restore infant homeostasis through their body temperature, touch, smell, heartbeat, lactation or verbal responses to the infant. These

experiences of responsivity and co-regulation have lifelong effects on emotional responses, attachment, stress responses and development throughout the lifespan (Bornstein, 2002; Eshel et al., 2006b; Ainsworth, 1979; WHO, 2004) and this responsive caregiving is the foundation of an attachment between the caregiver and the infant (Murray, 2000; Wolff and IJzendoorn, 1997; Hong and Park, 2012; Bornstein and Manian, 2013; Oates, 2007). Conversely, maternal non-responsiveness has been shown to predict insecure attachment at 12 months and challenging behaviour in toddlers and older children (Bornstein and Manian, 2013).

Attachment is a bond between the infant and a primary caregiver (Oates, 2007), a connection that is seen through the infant seeking out their caregiver when they have a need, and the infant feeling safe enough to explore their environment knowing the caregiver is nearby (Dunst and Kassow, 2008; Posada et al., 2002). Secure attachment develops when the infant perceives the caregiver as responsive and reliable (Oates, 2007). Whilst there are many contributors to developmental outcomes, secure attachment remains a significant factor in developing social skills, emotional regulation and cognitive and motor development (Sroufe as cited in (Oates, 2007; Alto and Petrenko, 2017). Furthermore, secure attachment has been found to be a predictor of social competence and resilience (WHO, 2004), where individuals with insecure attachment are more likely to have social and behavioural problems, cognitive difficulties and low self-esteem (WHO, 2004; Oates, 2007). They are also at higher risk of mental health problems (National Academies of Sciences and Medicine, 2016). This can have inter-generational implications where caregivers who experienced insecure attachment have challenges forming secure attachments with their infants (Oates, 2007; IJzendoorn et al., 1995).

Given that a considerable proportion of the world's infants live in low and middle income countries it is unfortunate that only 4% of infant research is conducted in LMIC settings (Tomlinson et al., 2005a). Much of the intervention research conducted in high-income countries was undertaken with infants who already had insecure attachment. The research

based in high-income countries has tended to focus on specific populations such as premature infants or low birth weight infants (Brisch et al., 2003), irritable infants (Klein Velderman et al., 2006), foster infants (Dozier et al., 2006), adopted infants (Hoksbergen et al., 1997), depressed mothers (Van Doesum et al., 2005), incarcerated caregivers (Baradon et al., 2008), adolescent caregivers (Riva Crugnola et al., 2016), and substance abusing caregivers (Polansky et al., 2006). Interventions included home visiting programmes with both highly skilled professionals and low skilled workers, parent-infant psychotherapy, baby massage, Video-feedback Intervention to promote Positive Parenting (VIPP), parenting groups, counselling and education sessions and written information for caregivers (Wright and Edginton, 2016; IJzendoorn et al., 1995).

In high-income settings there are many interventions that have been shown to support the development of responsive caregiving skills (Eshel et al., 2006b; Alto and Petrenko, 2017; Engle et al., 2007). Studies have suggested that the investment in early intervention results in better functioning families, a psychologically healthier society and improved social mobility (Black et al., 2017).

Caregivers who live in particularly stressful contexts, like many communities in low and middle income countries (LMICs) are likely to need additional support to be able to engage in optimal caregiving (Cooper et al., 2009b). Caregivers in LMICs are more likely to experience postnatal depression (Husain et al., 2006; Cooper et al., 2009b) and to be living in poverty, both of which are considerable risks to the caregiver/infant relationship. There have been reviews that more broadly explore caregiver responsiveness or attachment in LMIC settings but they have merged results between high-income and middle-income countries (Eshel et al., 2006a). This has made it difficult to discern whether interventions are universally effective in both settings. Many studies in this field have also looked at interventions to support responsive caregiving but the outcomes they have measured have been language and cognition rather than

responsivity or attachment (Aboud and Yousafzai, 2015). Another challenge in finding relevant studies is that many include children across a wide age range (for example 0-5) thus making it difficult to discern an optimum age for intervention (Yousafzai and Aboud, 2014). This review aims to address this gap in the literature by examining interventions exclusively in infancy that enable responsive caregiving or attachment in LMICs.

There is much research that substantiates the importance of responsive caregiving for better longer-term outcomes (Bornstein and Manian, 2013; Bornstein and Tamis-LeMonda, 1997; Bornstein et al., 2012b; Oates, 2007; WHO, 2004) but there is considerably less research on interventions to support responsivity and attachment. In addition, the research on responsive caregiving is difficult to synthesise because it is categorised under many different academic disciplines (psychology, neuroscience, child development, paediatrics, psychiatry and biology). Moreover, there is inconsistent use of language in this area of research (as will be apparent in the search terms used) which makes it difficult to collate the research on this topic.

Although systematic reviews in LMIC settings were conducted, these have had considerable limitations. A comprehensive review of the importance of infant/caregiver interactions was conducted on behalf of the WHO (Richter, 2004b). This review looked at the value of responsive caregiving but had a broader age focus than 0-2 years. It had little emphasis on interventions, but rather on understanding the relationship between responsivity and child development. Two years later the WHO published a systematic review of responsive caregiving interventions (Eshel et al, 2006b) but again their parameters were broad and the review explored both developed and developing countries. They also included special needs groups such as low birth weight (LBW) infants and a range of outcomes and age groups making it a challenge to make inferences for practical application. The breadth of these reviews makes it difficult to deduce which aspects of the interventions support the desired outcome. Furthermore, since the time of the review there has been considerable scientific advancement,

especially in neuroimaging that has enabled a greater understanding of the science underpinning responsive caregiving. UNICEF also conducted a systematic review on ECD parenting programmes in LMIC but it too was very broad in terms of intervention, outcomes and age of child at intervention (Britto, 2015). Other studies have merged high-income with LMIC data (Eshel et al., 2006a), have a very broad age category (Aboud et al., 2013b) or the intervention does support responsive caregiving or attachment but the outcomes measured are cognition and language (Grantham-Mcgregor and Smith, 2016)

Given how important responsivity and attachment are to optimal development, there is a need for an up-to-date and specific synthesis of responsive caregiving and attachment interventions in the first two years of life. This will enable deduction of specific aspects of programming that have the potential to be utilised in a LMIC setting.

Review questions

This review seeks to determine, through close examination of the literature, what interventions have been used with caregivers in LMICs to support caregiver responsivity and attachment and what the characteristics are of these interventions. More specifically the review will explore the following questions:

Main research question

What is the effect of the caregiver interventions on responsivity/sensitivity and attachment?

Subsidiary research questions

- What caregiver interventions purport to promote caregiver responsivity and infant attachment in infants under 24 months in a general population in low and middle-income countries?

- What are the key components of the interventions in terms of frequency of intervention, delivery method, length of intervention, age of infant at the beginning of the intervention and skill level of staff delivering intervention?

Objective of the review question

The objective of this systematic review is to identify interventions that purport to improve attachment, responsivity or sensitivity of caregivers of infants in LMICs and analyse the characteristics of the interventions. The key objectives are:

1. Identify interventions that seek to influence attachment, responsivity or sensitivity of caregivers of infants in LMICs.
2. Describe the interventions that emerge in the systematic review.
3. Break down the components of the interventions such as frequency of intervention, delivery method, age of infant at onset of intervention and skill level of staff delivering intervention to see which components have a bearing on the success of the intervention.

The review is part of a broader project on the First 1000 days with the Western Cape Department of Health who are reviewing what interventions could be implemented to support responsive caregiving which is an essential prerequisite for healthy development of the population.

Methodology

Literature search strategy

A comprehensive search of databases will be conducted. It is suggested that a systematic review requires at least 2 databases be used (Petticrew and Roberts, 2008) with a current average of 4 databases being utilised (Lam and McDiarmid, 2016). Given that studies needed to be conducted in low and middle income countries where only 2.3% of published infant studies are undertaken (Tomlinson et al., 2014), the review will explore a greater number of databases to try and capture all relevant literature. The databases were chosen based on emergent databases in the initial examination of literature, utilising databases that were used for other systematic reviews in maternal and child health and consultation with health sciences librarians. The databases to be searched will be: Pubmed, Scopus, PsycINFO, PsycARTICLES, Africa-Wide, CINAHL, Health Source, ERIC, SocINDEX, Cochrane Library. In addition, the WHO IRIS will also be searched for relevant documents. The reference lists within those documents will be scrutinised for published intervention studies. There will be further hand searching of all the reference lists of the articles selected from abstract screening.

Grey literature will not be included due to resource and time constraints. Finally, reference lists of studies reviewed will be scanned for other references that meet the inclusion criteria. The search will be documented using a search activity log.

Key words have been chosen by doing an initial scope of literature for synonyms used in this area of study. Furthermore, Google searches that included only .gov, .org and .edu domains will be used to identify further synonyms to be used in the academic searches. MESH terms will also be sought. Cochrane has published a filter for low and middle countries (contained in the appendix) (Cochrane, 2012b) to try and capture studies that may not be termed “low and

middle income” but take place in countries classified as such by the World Bank (Cochrane, 2012a; World Bank, 2017). The search terms from other reviews will also be scrutinised.

There is a wide variety of terms used in this area of research and publications fall under many academic disciplines. This will be adjusted for by using broad search terms that value sensitivity over specificity. In scoping other reviews, studies and reference lists many of the same references have been used so the preference will be for a broader search strategy to be able to identify if there are in fact other studies available. Specific interventions have not been included in the search terms, for example “psychotherapy” or “Video-feedback Intervention” to keep the results as broad and unbiased as possible.

The table below incorporates both the key words and Cochrane LMIC filter as well as the keywords.

Table 1. Search terms

P	(infant AND infancy OR baby OR “caregiver-child” OR “mother-infant” OR “caregiver-infant” OR “mother-baby” OR “parent-infant” OR “parent-child” OR toddler) ("developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed country" OR "lesser developed countries" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "under developed country" OR "under developed countries" OR "under developed nation" OR "under developed nations" OR "under developed population" OR "under developed populations" OR "under developed world" OR "underdeveloped country" OR "underdeveloped countries" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world" OR "middle income country" OR "middle income countries" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "low income country" OR "low income countries" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower income country" OR "lower income countries" OR "lower income nation" OR "lower income nations" OR "lower income population" OR "lower income populations" OR "underserved country" OR "underserved countries" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world" OR "underserved country" OR "underserved countries" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world" OR "underserved country" OR "underserved countries" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world" OR "deprived country" OR "deprived countries" OR "deprived nation" OR "deprived nations" OR "deprived population" OR "deprived populations" OR "deprived world" OR "poor country" OR "poor countries" OR "poor nation" OR "poor nations" OR "poor population" OR "poor
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	<p>populations" OR "poor world" OR "poorer country" OR "poorer countries" OR "poorer nation" OR "poorer nations" OR "poorer population" OR "poorer populations" OR "poorer world" OR "developing economy" OR "developing economies" OR "less developed economy" OR "less developed economies" OR "lesser developed economy" OR "lesser developed economies" OR "underdeveloped economy" OR "under developed economies" OR "underdeveloped economy" OR "underdeveloped economies" OR "middle income economy" OR "middle income economies" OR "low income economy" OR "low income economies" OR "lower income economy" OR "lower income economies" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR lmic OR lmics OR "third world" OR "lami country" OR "lami countries" OR "transitional country" OR "transitional countries")</p> <p>(Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Urundi OR Cambodia OR Khmer Republic OR Kampuchea OR Cameroon OR Cameroons OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Mayotte OR Congo OR Zaire OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Timor Leste OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR Gaza OR Georgia Republic OR Georgian Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldavia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR (Navigator AND Island) OR (Navigator AND Islands) OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadzhikistan OR Tadjikistan OR Tadjik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia)</p>
I	(therapy OR "parenting program*" OR education OR training OR intervention)

C	N/A
O	(sensitiv* OR relationship OR nurtur* OR "behaviour" OR responsiv* OR "emotional availab*" OR "infant mental health" OR attachment OR "sensitive caregiving" OR "responsive caregiving" OR secure)

Article Inclusion Criteria

The criteria for inclusion into the review were:

(i) publications in the English language. Whilst it is recognised that there is some bias in what studies are published in English (Bettany-Saltikov, 2010), this limitation is in place due to resource constraints.

(ii) publication dates ranging between 1966 and 2017. Much of the seminal and cited research in this area of study was published from the 1950s with the work of Ainsworth and Bowlby. The measurement of attachment was only begun in earnest with Mary Ainsworth's studies in the late 1960s (Ainsworth, 1969). Despite this literature being over 50 years old, it is still frequently cited in current research. 1966 has been chosen as this is the date that Medline (under PubMed) is available (Petticrew and Roberts, 2008) enabling the option of access to full text articles if required (McLellan, 2001).

(iii) studies that reported on caregiver interventions in infancy (as defined below) and that provide at least some details of what the intervention involved such as intensity of intervention, what level of staff delivered the intervention and what the content of the intervention was. Interventions can commence prior to birth.

(iv) Studies that are undertaken in low and middle-income countries (definition detailed below)

(v) Studies that measured outcomes of attachment, responsivity or sensitivity. It is imperative that the studies are intervention studies that have measurements of attachment, responsivity or sensitivity as their outcome. Responsive caregiving has been linked to many outcomes including improved cognition and mental health but for the purposes of this review this needs to be refined to the measurement of relationship outcomes of either responsivity or attachment. Studies that include other outcomes but do have attachment or responsivity as one of the outcomes can be included.

Exclusions: studies that focus exclusively and specifically on low birth weight (LBW) infants, premature infants, HIV positive infants or disabled infants as these infants have additional significant confounding factors that will adversely impact on outcomes. Likewise, studies that focus exclusively on caregiver groups such as caregivers with HIV, homeless caregivers, prisoner caregivers, caregivers with depression or substance abuse issues will also be excluded as they too will have considerable confounding factors. Studies with some mothers within the cohort with some of these challenges can be included provided it is not the entire cohort. No studies of institutionalised infants and caregivers will be included.

The review will consider most study designs except for case studies which have inadequate generalizability for this type of review.

Definitions

For the purposes of this review the following definitions apply:

Infant: A child aged from birth up until 24 months (Bornstein, 2002).

Caregiver: The individual who is the primary carer for the infant.

Responsive caregiving: “a mother’s/caregiver’s prompt, contingent and appropriate interaction with the child” (Eshel et al., 2006b) p.991.

Secure Attachment: A bond between infant and caregiver which results in the infant being content in the caregiver’s presence, the infant seeking out the caregiver and having pleasure in the relationship with the caregiver (Phillips and Shonkoff, 2000)

Low and middle-income countries is a term defined by the World Bank who group countries into one of four income categories: low, low-middle, upper-middle and high-income. This grouping is based on a per capita income. I will be utilising literature from countries that are classified into the first three categories as determined by the World Bank (World Bank, 2017).

Article Selection

Once the database searches have been undertaken, titles and abstracts of the studies will be assessed for meeting the inclusion criteria. Where databases have large search results that exceed 2000 results, their results will be imported into the software programme Rayyan for perusal. All references will be imported into Endnote so that duplicates can be identified. The included abstracts will have full text review to ensure that the study does indeed meet the inclusion criteria. Normally this process is undertaken by more than one researcher (Bettany-Saltikov, 2010; Petticrew and Roberts, 2008) but given that this is a mini dissertation that requires independent working and that resources are limited, this process will only be undertaken by a single researcher. However, the study is being overseen by two supervisors who will provide some checks as to whether the inclusion criteria are being consistently applied. The author will also use an online random number selector to identify 10% of included articles and 10% of full text exclusion articles to be reviewed by the supervisor against the inclusion/exclusion criteria as an additional check. Once the included studies are established, the critical appraisal will take place (detailed below).

Data extraction

Data from the articles included will be populated into a data extraction tool (contained in the appendix) which includes the following:

1. Author
2. Year
3. Country
4. Sample size
5. Sampling methods
6. Study duration
7. Gender of infants
8. Study design
9. Intervention
10. Data collection tool
11. Outcome measurement
12. Frequency of intervention
13. Any other outcomes assessed in the study

It may be once this process has started that additional categories will need to be included for data synthesis.

Appraisal of evidence

The included studies will be appraised using the Joanna Briggs Institute (JBI) checklists (Joanna Briggs Institute, 2017). JBI have checklists for all study designs, where other critical appraisal tools are only available for limited study designs. The scoping review suggested that many studies in this area of research are quasi-experimental designs and JBI also have a suitable appraisal tool for this study design. Many of the studies that arose in the scoping review explore multiple outcomes in addition to measures of caregiver-infant interaction and

attachment. These aspects of the studies will not be appraised. Study quality will be reviewed but will not be grounds for exclusion. A table of excluded studies is affixed as Additional File 2 in Part D: Supplementary Materials.

Data Synthesis

Given that the inclusion criteria do not specify a study design (ie.the results could be qualitative, quantitative or mixed methods) a meta-analysis will not be possible and the synthesis will more likely be narrative. The data extraction tool will generate a table (Popay et al., 2006) which will allow the reader of the review to see how the narrative synthesis was devised (Petticrew and Roberts, 2008). This should make the study more replicable (Bettany-Saltikov, 2010). To start, the key findings will need to be summarised (Ryan and Consumers, 2013; Popay et al., 2006) with details of the studies and their respective methodologies. The outcomes of the studies will be outlined. Studies will be divided into intervention types such as group interventions, home visiting interventions etc. The content will then be examined to look at trends in any factors such as frequency of intervention, timing of intervention and level of staff who implement the intervention which could lead to a theory as to why an intervention is or is not successful. Given how broad the category of “low and middle- income countries” is, it would be useful also to categorise by country to see if this influences outcome.

Timeline

The review will begin in June 2017. The initial scoping has suggested that there is not a considerable body of evidence of interventions for LMICs. It is anticipated that the data extraction process will not be very lengthy.

Table of Timeline

Part A: Protocol	Subject formulation	
	First Draft Sub deadlines: Intro &Background Justification of review Methodology inc.	8 June 2017 (achieved)
	Edits	24 November 2017
Part B: Literature review	Complete scoping review and refining search strategy	11 June (achieved)
	Systematic literature search including article exclusion/inclusions	26 November 2017 (achieved)
	Data extraction	26 November 2017 (achieved)
	Appraisal	20 February 2018
	Synthesis	23 February 2018
	Draft	5 th March 2018
	Edits	19 th March
	Journal article first draft	11 th March
	Intention to Submit	26 February 2018
	Final edition	25 th March 2018
	Submission	9 April 2018
	Dissemination	Post marking this document will be given to the WCDOH

Study Limitations

The greatest limitation is that the review will be conducted predominantly by a single reviewer which introduces selection bias. In order to mitigate this potential bias, a random selector will be used to identify 10% of included and excluded articles for an additional reviewer to review based on the inclusion/exclusion criteria. The exclusion process is very transparent where any studies excluded once full text review has commenced will be tabulated and can therefore be

examined as to whether there was bias. Although limiting the language to English alone risks a language bias, studies have suggested that this is not a considerable bias (Morrison et al., 2012; Jüni et al., 2002) and cannot be avoided due to resource constraints. Publication bias is also a risk due to exclusion of grey literature and that again cannot be mitigated due to resource and time constraints.

Ethical considerations

As this is a systematic review and involves no primary research there is no need for ethical review, nor are there ethical considerations.

Dissemination

The results of the review will be disseminated in thesis format which will be publicly available on the University of Cape Town website. Furthermore, as per MPH protocol, there will be a manuscript edition of the work which will be forwarded for publication with the aim of disseminating the findings among the academic community.

This study is being undertaken in partnership with the WCDOH who have specifically requested a review in this area. The systematic review will be presented to the WCDOH. The aim of the dissemination will be to inform the department of the best available evidence of interventions to support responsive caregiving to enable decision making around resource allocation

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Appendix A: Search activity Log

(University of Leeds retrieved from: <https://library.leeds.ac.uk/researcher-literature-search-documenting>)

My research question:	A systematic review of parenting interventions in infancy to enable responsive caregiving and secure attachment in low and middle-income countries.			
Places to search for information:	Pubmed, Scopus, PsycINFO, PsycARTICLES, Africa-Wide, CINAHL, Health Source, ERIC, SocINDEX, Cochrane Library			
List of sources searched:	Date of search	Search strategy used, including any limits	Total number of results found	Comments

Appendix B: Appraisal tools (JBI tools for quasi-experimental, RCT & qualitative studies)

JBI Critical Appraisal Checklist for Quasi-Experimental Studies (non-randomized experimental studies)

Reviewer _____ Date _____

Author _____ Year _____ Record Number _____

	Yes	No	Unclear	Not applicable
1. Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were the participants included in any comparisons similar?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Was there a control group?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of participants included in any comparisons measured in the same way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info

Comments (Including reason for exclusion)

Explanation for the critical appraisal tool for Quasi-Experimental Studies (experimental studies without random allocation)

How to cite: Tufanaru C, Munn Z, Aromataris E, Campbell J, Hopp L. Chapter 3: Systematic reviews of effectiveness. In: Aromataris E, Munn Z (Editors). Joanna Briggs Institute Reviewer's Manual. The Joanna Briggs Institute, 2017. Available from <https://reviewersmanual.joannabriggs.org/>

Critical Appraisal Tool for Quasi-Experimental Studies (experimental studies without random allocation)

Answers: Yes, No, Unclear or Not Applicable

1. Is it clear in the study what is the ‘cause’ and what is the ‘effect’ (i.e. there is no confusion about which variable comes first)?

Ambiguity with regards to the temporal relationship of variables constitutes a threat to the internal validity of a study exploring causal relationships. The ‘cause’ (the independent variable, that is, the treatment or intervention of interest) should occur in time before the explored ‘effect’ (the dependent variable, which is the effect or outcome of interest). Check if it is clear which variable is manipulated as a potential cause. Check if it is clear which variable is measured as the effect of the potential cause. Is it clear that the ‘cause’ was manipulated before the occurrence of the ‘effect’?

2. Were the participants included in any comparisons similar?

The differences between participants included in compared groups constitute a threat to the internal validity of a study exploring causal relationships. If there are differences between participants included in compared groups there is a risk of selection bias. If there are differences between participants included in the compared groups maybe the ‘effect’ cannot be attributed to the potential ‘cause’, as maybe it is plausible that the ‘effect’ may be explained by the differences between participants, that is, by selection bias. Check the characteristics reported for participants. Are the participants from the compared groups similar with regards to the characteristics that may explain the effect even in the absence of the ‘cause’, for example, age, severity of the disease, stage of the disease, co-existing conditions and so on? *[NOTE: In one single group pre-test/post-test studies where the patients are the same (the same one group) in any pre-post comparisons, the answer to this question should be ‘yes.’]*

3. Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?

In order to attribute the ‘effect’ to the ‘cause’ (the exposure or intervention of interest), assuming that there is no selection bias, there should be no other difference between the groups in terms of treatments or care received, other than the manipulated ‘cause’ (the

intervention of interest). If there are other exposures or treatments occurring in the same time with the 'cause', other than the intervention of interest, then potentially the 'effect' cannot be attributed to the intervention of interest, as it is plausible that the 'effect' may be explained by other exposures or treatments, other than the intervention of interest, occurring in the same time with the intervention of interest. Check the reported exposures or interventions received by the compared groups. Are there other exposures or treatments occurring in the same time with the intervention of interest? Is it plausible that the 'effect' may be explained by other exposures or treatments occurring in the same time with the intervention of interest?

4. Was there a control group?

Control groups offer the conditions to explore what would have happened with groups exposed to other different treatments, other than to the potential 'cause' (the intervention of interest). The comparison of the treated group (the group exposed to the examined 'cause', that is, the group receiving the intervention of interest) with such other groups strengthens the examination of the causal plausibility. The validity of causal inferences is strengthened in studies with at least one independent control group compared to studies without an independent control group. Check if there are independent, separate groups, used as control groups in the study. *[Note: The control group should be an independent, separate control group, not the pre-test group in a single group pre-test post-test design.]*

5. Were there multiple measurements of the outcome both pre and post the intervention/exposure?

In order to show that there is a change in the outcome (the 'effect') as a result of the intervention/treatment (the 'cause') it is necessary to compare the results of measurement before and after the intervention/treatment. If there is no measurement before the treatment and only measurement after the treatment is available it is not known if there is a change after the treatment compared to before the treatment. If multiple measurements are collected before the intervention/treatment is implemented then it is possible to explore the plausibility of alternative explanations other than the proposed 'cause' (the intervention of interest) for the observed 'effect', such as the naturally occurring changes in the absence of the 'cause', and changes of high (or low) scores towards less extreme values even in the absence of the 'cause' (sometimes called regression to the mean). If multiple measurements are collected after the intervention/treatment is implemented it is possible to explore the changes of the 'effect' in time in each group and to compare these changes across the groups. Check if measurements were collected before the intervention of interest was implemented. Were there multiple pre-test measurements? Check if measurements were collected after the intervention of interest was implemented. Were there multiple post-test measurements?

6. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?

If there are differences with regards to the loss to follow up between the compared groups these differences represent a threat to the internal validity of a study exploring causal effects as these differences may provide a plausible alternative explanation for the observed 'effect'

even in the absence of the ‘cause’ (the treatment or exposure of interest). Check if there were differences with regards to the loss to follow up between the compared groups. If follow up was incomplete (that is, there is incomplete information on all participants), examine the reported details about the strategies used in order to address incomplete follow up, such as descriptions of loss to follow up (absolute numbers; proportions; reasons for loss to follow up; patterns of loss to follow up) and impact analyses (the analyses of the impact of loss to follow up on results). Was there a description of the incomplete follow up (number of participants and the specific reasons for loss to follow up)? If there are differences between groups with regards to the loss to follow up, was there an analysis of patterns of loss to follow up? If there are differences between the groups with regards to the loss to follow up, was there an analysis of the impact of the loss to follow up on the results?

7. Were the outcomes of participants included in any comparisons measured in the same way?

If the outcome (the ‘effect’) is not measured in the same way in the compared groups there is a threat to the internal validity of a study exploring a causal relationship as the differences in outcome measurements may be confused with an effect of the treatment or intervention of interest (the ‘cause’). Check if the outcomes were measured in the same way. Same instrument or scale used? Same measurement timing? Same measurement procedures and instructions?

8. Were outcomes measured in a reliable way?

Unreliability of outcome measurements is one threat that weakens the validity of inferences about the statistical relationship between the ‘cause’ and the ‘effect’ estimated in a study exploring causal effects. Unreliability of outcome measurements is one of different plausible explanations for errors of statistical inference with regards to the existence and the magnitude of the effect determined by the treatment (‘cause’). Check the details about the reliability of measurement such as the number of raters, training of raters, the intra-rater reliability, and the inter-raters reliability within the study (not to external sources). This question is about the reliability of the measurement performed in the study, it is not about the validity of the measurement instruments/scales used in the study. *[Note: Two other important threats that weaken the validity of inferences about the statistical relationship between the ‘cause’ and the ‘effect’ are low statistical power and the violation of the assumptions of statistical tests. These other threats are not explored within Question 8, these are explored within Question 9.]*

9. Was appropriate statistical analysis used?

Inappropriate statistical analysis may cause errors of statistical inference with regards to the existence and the magnitude of the effect determined by the treatment (‘cause’). Low statistical power and the violation of the assumptions of statistical tests are two important threats that weakens the validity of inferences about the statistical relationship between the ‘cause’ and the ‘effect’. Check the following aspects: if the assumptions of statistical tests were respected; if appropriate statistical power analysis was performed; if appropriate effect

sizes were used; if appropriate statistical procedures or methods were used given the number and type of dependent and independent variables, the number of study groups, the nature of the relationship between the groups (independent or dependent groups), and the objectives of statistical analysis (association between variables; prediction; survival analysis etc.).

JBI Critical Appraisal Checklist for Randomized Controlled Trials

Reviewer _____ Date _____

Author _____ Year _____ Record Number _____

	Yes	No	Unclear	NA
10. Was true randomization used for assignment of participants to treatment groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Was allocation to treatment groups concealed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Were treatment groups similar at the baseline?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Were participants blind to treatment assignment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Were those delivering treatment blind to treatment assignment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Were outcomes assessors blind to treatment assignment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Were treatment groups treated identically other than the intervention of interest?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Were participants analyzed in the groups to which they were randomized?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Were outcomes measured in the same way for treatment groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info

Comments (Including reason for exclusion)

Explanation for the critical appraisal tool for RCTs with individual participants in parallel groups

How to cite: Tufanaru C, Munn Z, Aromataris E, Campbell J, Hopp L. Chapter 3: Systematic reviews of effectiveness. In: Aromataris E, Munn Z (Editors). Joanna Briggs Institute Reviewer's Manual. The Joanna Briggs Institute, 2017. Available from <https://reviewersmanual.joannabriggs.org/>

Critical Appraisal Tool for RCTs (individual participants in parallel groups)

Answers: Yes, No, Unclear or Not Applicable

1. Was true randomization used for assignment of participants to treatment groups?

The differences between participants included in compared groups constitutes a threat to the internal validity of a study exploring causal relationships. If participants are not allocated to treatment and control groups by random assignment there is a risk that the allocation is influenced by the known characteristics of the participants and these differences between the groups may distort the comparability of the groups. A true random assignment of participants to the groups means that a procedure is used that allocates the participants to groups purely based on chance, not influenced by the known characteristics of the participants. Check the details about the randomization procedure used for allocation of the participants to study groups. Was a true chance (random) procedure used? For example, was a list of random numbers used? Was a computer-generated list of random numbers used?

2. Was allocation to groups concealed?

If those allocating participants to the compared groups are aware of which group is next in the allocation process, that is, treatment or control, there is a risk that they may deliberately and purposefully intervene in the allocation of patients by preferentially allocating patients to the treatment group or to the control group and therefore this may distort the implementation of allocation process indicated by the randomization and therefore the results of the study may be distorted. Concealment of allocation (allocation concealment) refers to procedures that prevent those allocating patients from knowing before allocation which treatment or control is next in the allocation process. Check the details about the procedure used for allocation concealment. Was an appropriate allocation concealment procedure used? For example, was central randomization used? Were sequentially numbered, opaque and sealed envelopes used? Were coded drug packs used?

3. Were treatment groups similar at the baseline?

The differences between participants included in compared groups constitute a threat to the internal validity of a study exploring causal relationships. If there are differences

between participants included in compared groups there is a risk of selection bias. If there are differences between participants included in the compared groups maybe the 'effect' cannot be attributed to the potential 'cause' (the examined intervention or treatment), as maybe it is plausible that the 'effect' may be explained by the differences between participants, that is, by selection bias. Check the characteristics reported for participants. Are the participants from the compared groups similar with regards to the characteristics that may explain the effect even in the absence of the 'cause', for example, age, severity of the disease, stage of the disease, co-existing conditions and so on? Check the proportions of participants with specific relevant characteristics in the compared groups. Check the means of relevant measurements in the compared groups (pain scores; anxiety scores; etc.). *[Note: Do NOT only consider the P-value for the statistical testing of the differences between groups with regards to the baseline characteristics.]*

4. Were participants blind to treatment assignment?

If participants are aware of their allocation to the treatment group or to the control group there is the risk that they may behave differently and respond or react differently to the intervention of interest or to the control intervention respectively compared to the situations when they are not aware of treatment allocation and therefore the results of the study may be distorted. Blinding of participants is used in order to minimize this risk. Blinding of the participants refers to procedures that prevent participants from knowing which group they are allocated. If blinding of participants is used, participants are not aware if they are in the group receiving the treatment of interest or if they are in any other group receiving the control interventions. Check the details reported in the article about the blinding of participants with regards to treatment assignment. Was an appropriate blinding procedure used? For example, were identical capsules or syringes used? Were identical devices used? Be aware of different terms used, blinding is sometimes also called masking.

5. Were those delivering treatment blind to treatment assignment?

If those delivering treatment are aware of participants' allocation to the treatment group or to the control group there is the risk that they may behave differently with the participants from the treatment group and the participants from the control group, or that they may treat them differently, compared to the situations when they are not aware of treatment allocation and this may influence the implementation of the compared treatments and the results of the study may be distorted. Blinding of those delivering treatment is used in order to minimize this risk. Blinding of those delivering treatment refers to procedures that prevent those delivering treatment from knowing which group they are treating, that is those delivering treatment are not aware if they are treating the group receiving the treatment of interest or if they are treating any other group receiving the control interventions. Check the details reported in the article about the blinding of those delivering treatment with regards to treatment assignment. Is there any information in the article about those delivering the treatment? Were those delivering the treatment unaware of the assignments of participants to the compared groups?

6. Were outcomes assessors blind to treatment assignment?

If those assessing the outcomes are aware of participants' allocation to the treatment group or to the control group there is the risk that they may behave differently with the participants from the treatment group and the participants from the control group compared to the situations when they are not aware of treatment allocation and therefore there is the risk that the measurement of the outcomes may be distorted and the results of the study may be distorted. Blinding of outcomes assessors is used in order to minimize this risk. Check the details reported in the article about the blinding of outcomes assessors with regards to treatment assignment. Is there any information in the article about outcomes assessors? Were those assessing the treatment's effects on outcomes unaware of the assignments of participants to the compared groups?

7. Were treatment groups treated identically other than the intervention of interest?

In order to attribute the 'effect' to the 'cause' (the treatment or intervention of interest), assuming that there is no selection bias, there should be no other difference between the groups in terms of treatment or care received, other than the manipulated 'cause' (the treatment or intervention controlled by the researchers). If there are other exposures or treatments occurring at the same time with the 'cause' (the treatment or intervention of interest), other than the 'cause', then potentially the 'effect' cannot be attributed to the examined 'cause' (the investigated treatment), as it is plausible that the 'effect' may be explained by other exposures or treatments occurring at the same time with the 'cause' (the treatment of interest). Check the reported exposures or interventions received by the compared groups. Are there other exposures or treatments occurring at the same time with the 'cause'? Is it plausible that the 'effect' may be explained by other exposures or treatments occurring at the same time with the 'cause'? Is it clear that there is no other difference between the groups in terms of treatment or care received, other than the treatment or intervention of interest?

8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?

For this question, follow up refers to the time period from the moment of random allocation (random assignment or randomization) to compared groups to the end time of the trial. This critical appraisal question asks if there is complete knowledge (measurements, observations etc.) for the entire duration of the trial as previously defined (that is, from the moment of random allocation to the end time of the trial), for all randomly allocated participants. If there is incomplete follow up, that is incomplete knowledge about all randomly allocated participants, this is known in the methodological literature as the post-assignment attrition. As RCTs are not perfect, there is almost always post-assignment attrition, and the focus of this question is on the appropriate exploration of post-assignment attrition (description of loss to follow up, description of the reasons for loss to follow up, the estimation of the impact of loss to follow up on the effects etc.). If there are differences with regards to the loss to follow up between the compared groups in an RCT, these

differences represent a threat to the internal validity of a randomized experimental study exploring causal effects, as these differences may provide a plausible alternative explanation for the observed ‘effect’ even in the absence of the ‘cause’ (the treatment or intervention of interest). When appraising an RCT, check if there were differences with regards to the loss to follow up between the compared groups. If follow up was incomplete (that is, there is incomplete information on all participants), examine the reported details about the strategies used in order to address incomplete follow up, such as descriptions of loss to follow up (absolute numbers; proportions; reasons for loss to follow up) and impact analyses (the analyses of the impact of loss to follow up on results). Was there a description of the incomplete follow up (number of participants and the specific reasons for loss to follow up)? It is important to note that with regards to loss to follow up, it is not enough to know the number of participants and the proportions of participants with incomplete data; the reasons for loss to follow up are essential in the analysis of risk of bias; even if the numbers and proportions of participants with incomplete data are similar or identical in compared groups, if the patterns of reasons for loss to follow up are different (for example, side effects caused by the intervention of interest, lost contact etc.), these may impose a risk of bias if not appropriately explored and considered in the analysis. If there are differences between groups with regards to the loss to follow up (numbers/proportions and reasons), was there an analysis of patterns of loss to follow up? If there are differences between the groups with regards to the loss to follow up, was there an analysis of the impact of the loss to follow up on the results? [Note: Question 8 is NOT about intention-to-treat (ITT) analysis; question 9 is about ITT analysis.]

9. Were participants analyzed in the groups to which they were randomized?

This question is about the intention-to-treat (ITT) analysis. There are different statistical analysis strategies available for the analysis of data from randomized controlled trials, such as intention-to-treat analysis (known also as intent to treat; abbreviated, ITT), per-protocol analysis, and as-treated analysis. In the ITT analysis the participants are analyzed in the groups to which they were randomized, regardless of whether they actually participated or not in those groups for the entire duration of the trial, received the experimental intervention or control intervention as planned or whether they were compliant or not with the planned experimental intervention or control intervention. The ITT analysis compares the outcomes for participants from the initial groups created by the initial random allocation of participants to those groups. Check if ITT was reported; check the details of the ITT. Were participants analyzed in the groups to which they were initially randomized, regardless of whether they actually participated in those groups, and regardless of whether they actually received the planned interventions? [Note: The ITT analysis is a type of statistical analysis recommended in the Consolidated Standards of Reporting Trials (CONSORT) statement on best practices in trials reporting, and it is considered a marker of good methodological quality of the analysis of results of a randomized trial. The ITT is estimating the effect of offering the intervention, that is, the effect of instructing the participants to use or take the intervention; the ITT it is not estimating the effect of actually receiving the intervention of interest.]

10. Were outcomes measured in the same way for treatment groups?

If the outcome (the ‘effect’) is not measured in the same way in the compared groups there is a threat to the internal validity of a study exploring a causal relationship as the differences in outcome measurements may be confused with an effect of the treatment (the ‘cause’). Check if the outcomes were measured in the same way. Same instrument or scale used? Same measurement timing? Same measurement procedures and instructions?

11. Were outcomes measured in a reliable way?

Unreliability of outcome measurements is one threat that weakens the validity of inferences about the statistical relationship between the ‘cause’ and the ‘effect’ estimated in a study exploring causal effects. Unreliability of outcome measurements is one of the different plausible explanations for errors of statistical inference with regards to the existence and the magnitude of the effect determined by the treatment (‘cause’). Check the details about the reliability of measurement such as the number of raters, training of raters, the intra-rater reliability, and the inter-raters reliability within the study (not as reported in external sources). This question is about the reliability of the measurement performed in the study, it is not about the validity of the measurement instruments/scales used in the study. *[Note: Two other important threats that weaken the validity of inferences about the statistical relationship between the ‘cause’ and the ‘effect’ are low statistical power and the violation of the assumptions of statistical tests. These other two threats are explored within Question 12).]*

12. Was appropriate statistical analysis used?

Inappropriate statistical analysis may cause errors of statistical inference with regards to the existence and the magnitude of the effect determined by the treatment (‘cause’). Low statistical power and the violation of the assumptions of statistical tests are two important threats that weaken the validity of inferences about the statistical relationship between the ‘cause’ and the ‘effect’. Check the following aspects: if the assumptions of statistical tests were respected; if appropriate statistical power analysis was performed; if appropriate effect sizes were used; if appropriate statistical procedures or methods were used given the number and type of dependent and independent variables, the number of study groups, the nature of the relationship between the groups (independent or dependent groups), and the objectives of statistical analysis (association between variables; prediction; survival analysis etc.).

13. Was the trial design appropriate for the topic, and any deviations from the standard RCT design accounted for in the conduct and analysis?

Certain RCT designs, such as the crossover RCT, should only be conducted when appropriate. Alternative designs may also present additional risks of bias if not accounted for in the design and analysis.

Crossover trials should only be conducted in people with a chronic, stable condition, where the intervention produces a short term effect (i.e. relief in symptoms). Crossover trials should ensure there is an appropriate period of washout between treatments.

Cluster RCTs randomize groups of individuals, forming 'clusters.' When we are assessing outcomes on an individual level in cluster trials, there are unit-of-analysis issues, as individuals within a cluster are correlated. This should be taken into account by the study authors when conducting analysis, and ideally authors will report the intra-cluster correlation coefficient.

Stepped-wedge RCTs may be appropriate when it is expected the intervention will do more good than harm, or due to logistical, practical or financial considerations in the roll out of a new treatment/intervention. Data analysis in these trials should be conducted appropriately, taking into account the effects of time.

JBI Critical Appraisal Checklist for Qualitative Research

Reviewer _____ Date _____

Author _____ Year _____ Record Number _____

	Yes	No	Unclear	Not applicable
23. Is there congruity between the stated philosophical perspective and the research methodology?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Is there congruity between the research methodology and the research question or objectives?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Is there congruity between the research methodology and the methods used to collect data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Is there congruity between the research methodology and the representation and analysis of data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Is there congruity between the research methodology and the interpretation of results?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Is there a statement locating the researcher culturally or theoretically?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Is the influence of the researcher on the research, and vice-versa, addressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Are participants, and their voices, adequately represented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal: Include Exclude Seek further info

Comments (Including reason for exclusion)

Discussion of Critical Appraisal Criteria

How to cite: Lockwood C, Munn Z, Porritt K. Qualitative research synthesis: methodological guidance for systematic reviewers utilizing meta-aggregation. *Int J Evid Based Healthc.* 2015;13(3):179–187.

1. Congruity between the stated philosophical perspective and the research methodology

Does the report clearly state the philosophical or theoretical premises on which the study is based? Does the report clearly state the methodological approach adopted on which the study is based? Is there congruence between the two? For example:

A report may state that the study adopted a critical perspective and participatory action research methodology was followed. Here there is congruence between a critical view (focusing on knowledge arising out of critique, action and reflection) and action research (an approach that focuses on firstly working with groups to reflect on issues or practices, then considering how they could be different; then acting to create a change; and finally identifying new knowledge arising out of the action taken). However, a report may state that the study adopted an interpretive perspective and used survey methodology. Here there is incongruence between an interpretive view (focusing on knowledge arising out of studying what phenomena mean to individuals or groups) and surveys (an approach that focuses on asking standard questions to a defined study population); a report may state that the study was qualitative or used qualitative methodology (such statements do not demonstrate rigour in design) or make no statement on philosophical orientation or methodology.

2. Congruity between the research methodology and the research question or objectives

Is the study methodology appropriate for addressing the research question? For example: A report may state that the research question was to seek understandings of the meaning of pain in a group of people with rheumatoid arthritis and that a phenomenological approach was taken. Here, there is congruity between this question and the methodology. A report may state that the research question was to establish the effects of counselling on the severity of pain experience and that an ethnographic approach was pursued. A question that tries to establish cause-and effect cannot be addressed by using an ethnographic approach (as ethnography sets out to develop understandings of cultural practices) and thus, this would be incongruent.

3. Congruity between the research methodology and the methods used to collect data

Are the data collection methods appropriate to the methodology? For example:

A report may state that the study pursued a phenomenological approach and data was collected through phenomenological interviews. There is congruence between the methodology and data collection; a report may state that the study pursued a phenomenological approach and data was collected through a postal questionnaire. There is incongruence between the methodology and data collection here as phenomenology seeks to elicit rich descriptions of the experience of a phenomena that cannot be achieved through seeking written responses to standardized questions.

4. Congruity between the research methodology and the representation and analysis of data

Are the data analyzed and represented in ways that are congruent with the stated methodological position? For example:

A report may state that the study pursued a phenomenological approach to explore people's experience of grief by asking participants to describe their experiences of grief. If the text generated from asking these questions is searched to establish the meaning of grief to participants, and the meanings of all participants are included in the report findings, then this represents congruity; the same report may, however, focus only on those meanings that were common to all participants and discard single reported meanings. This would not be appropriate in phenomenological work.

5. There is congruence between the research methodology and the interpretation of results

Are the results interpreted in ways that are appropriate to the methodology? For example:

A report may state that the study pursued a phenomenological approach to explore people's experience of facial disfigurement and the results are used to inform practitioners about accommodating individual differences in care. There is congruence between the methodology and this approach to interpretation; a report may state that the study pursued a phenomenological approach to explore people's experience of facial disfigurement and the results are used to generate practice checklists for assessment. There is incongruence between the methodology and this approach to interpretation as phenomenology seeks to understand the meaning of a phenomenon for the study participants and cannot be interpreted to suggest that this can be generalized to total populations to a degree where standardized assessments will have relevance across a population.

6. Locating the researcher culturally or theoretically

Are the beliefs and values, and their potential influence on the study declared? For example:

The researcher plays a substantial role in the qualitative research process and it is important, in appraising evidence that is generated in this way, to know the researcher's cultural and theoretical orientation. A high quality report will include a statement that clarifies this.

7. Influence of the researcher on the research, and vice-versa, is addressed

Is the potential for the researcher to influence the study and for the potential of the research process itself to influence the researcher and her/his interpretations acknowledged and addressed? For example:

Is the relationship between the researcher and the study participants addressed? Does the researcher critically examine her/his own role and potential influence during data collection? Is it reported how the researcher responded to events that arose during the study?

8. Representation of participants and their voices

Generally, reports should provide illustrations from the data to show the basis of their conclusions and to ensure that participants are represented in the report.

9. Ethical approval by an appropriate body

A statement on the ethical approval process followed should be in the report.

10. Relationship of conclusions to analysis, or interpretation of the data

This criterion concerns the relationship between the findings reported and the views or words of study participants. In appraising a paper, appraisers seek to satisfy themselves that the conclusions drawn by the research are based on the data collected; data being the text generated through observation, interviews or other processes.

Appendix C: data extraction template

	Year	Author	Title	Intervention	Country	Sample	Frequency	Staff	Age of infants	Relevant Outcome measure	Findings	Journal	Study Design	Appraisal Tool Score

Appendix D Cochrane Filter for LMIC

Low and Middle Income Countries – LMIC Filters

The Cochrane Central Register of Controlled Trials (CENTRAL) (Cochrane Library Online)

- #1 (Africa or Asia or Caribbean or "West Indies" or "South America" or "Latin America" or "Central America"):ti,ab,kw
- #2 (Afghanistan or Albania or Algeria or Angola or Antigua or Barbuda or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bahrain or Bangladesh or Barbados or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brasil or Brazil or Bulgaria or "Burkina Faso" or "Burkina Fasso" or "Upper Volta" or Burundi or Urundi or Cambodia or "Khmer Republic" or Kampuchea or Cameroon or Cameroons or Cameron or Camerons or "Cape Verde" or "Central African Republic" or Chad or Chile or China or Colombia or Comoros or "Comoro Islands" or Comores or Mayotte or Congo or Zaire or "Costa Rica" or "Cote d'Ivoire" or "Ivory Coast" or Croatia or Cuba or Cyprus or Czechoslovakia or "Czech Republic" or Slovakia or "Slovak Republic"):ti,ab,kw
- #3 (Djibouti or "French Somaliland" or Dominica or "Dominican Republic" or "East Timor" or "East Timur" or "Timor Leste" or Ecuador or Egypt or "United Arab Republic" or "El Salvador" or Eritrea or Estonia or Ethiopia or Fiji or Gabon or "Gabonese Republic" or Gambia or Gaza or Georgia or Georgian or Ghana or "Gold Coast" or Greece or Grenada or Guatemala or Guinea or Guam or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or "Isle of Man" or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or "Kyrgyz Republic" or Kirghiz or Kirgizstan or "Lao PDR" or Laos or Latvia or Lebanon or Lesotho or Basutoland or Liberia or Libya or Lithuania):ti,ab,kw
- #4 (Macedonia or Madagascar or "Malagasy Republic" or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Nyasaland or Mali or Malta or "Marshall Islands" or Mauritania or Mauritius or "Agalega Islands" or Mexico or Micronesia or "Middle East" or Moldova or Moldovia or Moldovian or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or "Netherlands Antilles" or "New Caledonia" or Nicaragua or Niger or Nigeria or "Northern Mariana Islands" or Oman or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Poland or Portugal or "Puerto Rico"):ti,ab,kw

- #5 (Romania or Rumania or Roumania or Russia or Russian or Rwanda or Ruanda or "Saint Kitts" or "St Kitts" or Nevis or "Saint Lucia" or "St Lucia" or "Saint Vincent" or "St Vincent" or Grenadines or Samoa or "Samoa Islands" or "Navigator Island" or "Navigator Islands" or "Sao Tome" or "Saudi Arabia" or Senegal or Serbia or Montenegro or Seychelles or "Sierra Leone" or Slovenia or "Sri Lanka" or Ceylon or "Solomon Islands" or Somalia or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadjikistan or Tadjik or Tanzania or Thailand or Togo or "Togolese Republic" or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uruguay or USSR or "Soviet Union" or "Union of Soviet Socialist Republics" or Uzbekistan or Uzbek or Vanuatu or "New Hebrides" or Venezuela or Vietnam or "Viet Nam" or "West Bank" or Yemen or Yugoslavia or Zambia or Zimbabwe or Rhodesia):**ti,ab,kw**
- #6 (developing or less* NEXT developed or "under developed" or underdeveloped or "middle income" or low* NEXT income or underserved or "under served" or deprived or poor*) NEXT (countr* or nation* or population* or world):**ti,ab,kw**
- #7 (developing or less* NEXT developed or "under developed" or underdeveloped or "middle income" or low* NEXT income) NEXT (economy or economies):**ti,ab,kw**
- #8 low* NEXT (gdp or gnp or "gross domestic" or "gross national"): **ti,ab,kw**
- #9 (low NEAR/3 middle NEAR/3 countr*):**ti,ab,kw**
- #10 (lmic or lmic or "third world" or "lami country" or "lami countries"): **ti,ab,kw**
- #11 ("transitional country" or "transitional countries"): **ti,ab,kw**
- #12 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11)

EMBASE (Ovid)

1. Developing Country.**sh.**
2. (Africa or Asia or Caribbean or West Indies or South America or Latin America or Central America).**hw,ti,ab,cp.**
3. (Afghanistan or Albania or Algeria or Angola or Antigua or Barbuda or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bahrain or Bangladesh or Barbados or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brasil or Brazil or Bulgaria or Burkina Faso or Burkina Fasso or Upper Volta or Burundi or Urundi or Cambodia or Khmer Republic or Kampuchea or Cameroon or Cameroons or Cameron or Camerons or Cape Verde or Central African Republic or Chad or Chile or China or Colombia or Comoros or Comoro Islands or Comores or Mayotte

or Congo or Zaire or Costa Rica or Cote d'Ivoire or Ivory Coast or Croatia or Cuba or Cyprus or Czechoslovakia or Czech Republic or Slovakia or Slovak Republic or Djibouti or French Somaliland or Dominica or Dominican Republic or East Timor or East Timor or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Estonia or Ethiopia or Fiji or Gabon or Gabonese Republic or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Gold Coast or Greece or Grenada or Guatemala or Guinea or Guam or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or Isle of Man or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or Kirghiz or Kirgizstan or Lao PDR or Laos or Latvia or Lebanon or Lesotho or Basutoland or Liberia or Libya or Lithuania or Macedonia or Madagascar or Malagasy Republic or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Nyasaland or Mali or Malta or Marshall Islands or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Middle East or Moldova or Moldovia or Moldovian or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Netherlands Antilles or New Caledonia or Nicaragua or Niger or Nigeria or Northern Mariana Islands or Oman or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillipines or Poland or Portugal or Puerto Rico or Romania or Rumania or Roumania or Russia or Russian or Rwanda or Ruanda or Saint Kitts or St Kitts or Nevis or Saint Lucia or St Lucia or Saint Vincent or St Vincent or Grenadines or Samoa or Samoan Islands or Navigator Island or Navigator Islands or Sao Tome or Saudi Arabia or Senegal or Serbia or Montenegro or Seychelles or Sierra Leone or Slovenia or Sri Lanka or Ceylon or Solomon Islands or Somalia or South Africa or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadzhiestan or Tadjikistan or Tadjhik or Tanzania or Thailand or Togo or Togolese Republic or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uruguay or USSR or Soviet Union or Union of Soviet Socialist Republics or Uzbekistan or Uzbek or Vanuatu or New Hebrides or Venezuela or Vietnam or Viet Nam or West Bank or Yemen or Yugoslavia or Zambia or Zimbabwe or Rhodesia).**hw,ti,ab,cp.**

4. ((developing or less* developed or under developed or underdeveloped or middle income or low* income or underserved or under served or deprived or poor*) adj (countr* or nation? or population? or world)).**ti,ab.**

5. ((developing or less* developed or under developed or underdeveloped or middle income or low* income) adj (economy or economies)).**ti,ab.**

6. (low* adj (gdp or gnp or gross domestic or gross national)).**ti,ab.**

7. (low adj3 middle adj3 countr*).**ti,ab.**

8. (lmic or lmics or third world or lami countr*).**ti,ab.**

9. transitional countr*.**ti,ab.**

10. or/1-9

MEDLINE (Ovid)

1. Developing Countries.**sh,kf.**

2. (Africa or Asia or Caribbean or West Indies or South America or Latin America or Central America).**hw,kf,ti,ab,cp.**

3. (Afghanistan or Albania or Algeria or Angola or Antigua or Barbuda or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bahrain or Bangladesh or Barbados or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brasil or Brazil or Bulgaria or Burkina Faso or Burkina Fasso or Upper Volta or Burundi or Urundi or Cambodia or Khmer Republic or Kampuchea or Cameroon or Cameroons or Cameron or Camerons or Cape Verde or Central African Republic or Chad or Chile or China or Colombia or Comoros or Comoro Islands or Comores or Mayotte or Congo or Zaire or Costa Rica or Cote d'Ivoire or Ivory Coast or Croatia or Cuba or Cyprus or Czechoslovakia or Czech Republic or Slovakia or Slovak Republic or Djibouti or French Somaliland or Dominica or Dominican Republic or East Timor or East Timur or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Estonia or Ethiopia or Fiji or Gabon or Gabonese Republic or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Gold Coast or Greece or Grenada or Guatemala or Guinea or Guam or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or Isle of Man or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or Kirghiz or Kirgizstan or Lao PDR or Laos or Latvia or Lebanon or Lesotho or Basutoland or Liberia or Libya or Lithuania or Macedonia or Madagascar or Malagasy Republic or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Nyasaland or Mali or Malta or Marshall Islands or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Middle East or Moldova or Moldovia or Moldovian or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Netherlands Antilles or New Caledonia or Nicaragua or Niger or Nigeria or Northern Mariana Islands or Oman or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Poland or Portugal or Puerto Rico or Romania or Rumania or Roumania or Russia or Russian or Rwanda or Ruanda or Saint Kitts or St Kitts or Nevis or Saint Lucia or St Lucia or Saint Vincent or St Vincent or Grenadines or Samoa or Samoan Islands or Navigator Island or Navigator Islands or Sao Tome or Saudi Arabia or Senegal or Serbia or Montenegro or Seychelles or Sierra Leone or Slovenia or Sri Lanka or Ceylon or Solomon Islands or Somalia or South Africa or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadzhikistan or Tadjikistan or Tadjhik or Tanzania or Thailand or Togo or Togolese Republic or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uruguay or USSR or Soviet Union or Union of Soviet Socialist Republics or Uzbekistan or Uzbek or Vanuatu or New Hebrides or Venezuela or Vietnam or Viet Nam or West Bank or Yemen or Yugoslavia or Zambia or Zimbabwe or Rhodesia).**hw,kf,ti,ab,cp.**

4. ((developing or less* developed or under developed or underdeveloped or middle income or low* income or underserved or under served or deprived or poor*) adj (countr* or nation? or population? or world)).**ti,ab.**

5. ((developing or less* developed or under developed or underdeveloped or middle income or low* income) adj (economy or economies)).**ti,ab.**

6. (low* adj (gdp or gnp or gross domestic or gross national)).**ti,ab.**

7. (low adj3 middle adj3 countr*).**ti,ab.**

8. (lmic or lmics or third world or lami countr*).**ti,ab.**

9. transitional countr*.**ti,ab.**

10. or/1-9

PubMed Filter 1

(Searches the following fields: title, abstract, other abstract, MeSH, other terms, place of publication)

#10 Search #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9

#9 Search "developing country"[tiab] OR "developing countries"[tiab] OR "developing nation"[tiab] OR "developing nations"[tiab] OR "developing population"[tiab] OR "developing populations"[tiab] OR "developing world"[tiab] OR "less developed country"[tiab] OR "less developed countries"[tiab] OR "less developed nation"[tiab] OR "less developed nations"[tiab] OR "less developed population"[tiab] OR "less developed populations"[tiab] OR "less developed world"[tiab] OR "lesser developed country"[tiab] OR "lesser developed countries"[tiab] OR "lesser developed nation"[tiab] OR "lesser developed nations"[tiab] OR "lesser developed population"[tiab] OR "lesser developed populations"[tiab] OR "lesser developed world"[tiab] OR "under developed country"[tiab] OR "under developed countries"[tiab] OR "under developed nation"[tiab] OR "under developed nations"[tiab] OR "under developed population"[tiab] OR "under developed populations"[tiab] OR "under developed world"[tiab] OR "underdeveloped country"[tiab] OR "underdeveloped countries"[tiab] OR "underdeveloped nation"[tiab] OR "underdeveloped nations"[tiab] OR "underdeveloped population"[tiab] OR "underdeveloped populations"[tiab] OR "underdeveloped world"[tiab] OR "middle income country"[tiab] OR "middle income countries"[tiab] OR "middle income nation"[tiab] OR "middle income nations"[tiab] OR "middle income population"[tiab] OR "middle income populations"[tiab] OR "low income country"[tiab] OR "low income countries"[tiab] OR "low income nation"[tiab] OR "low income nations"[tiab] OR "low income population"[tiab] OR "low income populations"[tiab] OR "lower income country"[tiab] OR "lower income countries"[tiab] OR "lower income nation"[tiab] OR "lower income nations"[tiab] OR "lower income population"[tiab] OR "lower income populations"[tiab] OR "underserved country"[tiab] OR "underserved countries"[tiab] OR "underserved nation"[tiab] OR "underserved nations"[tiab] OR "underserved population"[tiab] OR "underserved populations"[tiab] OR "underserved world"[tiab] OR "under served country"[tiab] OR "under served countries"[tiab] OR "under served nation"[tiab] OR "under served nations"[tiab] OR "under served population"[tiab] OR "under served populations"[tiab] OR "under served world"[tiab] OR "deprived country"[tiab] OR "deprived countries"[tiab] OR "deprived nation"[tiab] OR "deprived nations"[tiab] OR "deprived population"[tiab] OR "deprived populations"[tiab] OR "deprived world"[tiab] OR "poor country"[tiab] OR "poor countries"[tiab] OR "poor nation"[tiab] OR "poor nations"[tiab] OR "poor population"[tiab] OR "poor populations"[tiab] OR "poor world"[tiab] OR "poorer country"[tiab] OR "poorer countries"[tiab] OR "poorer nation"[tiab] OR "poorer nations"[tiab] OR "poorer population"[tiab] OR "poorer populations"[tiab] OR "poorer

world"[tiab] OR "developing economy"[tiab] OR "developing economies"[tiab] OR "less developed economy"[tiab] OR "less developed economies"[tiab] OR "lesser developed economy"[tiab] OR "lesser developed economies"[tiab] OR "under developed economy"[tiab] OR "under developed economies"[tiab] OR "underdeveloped economy"[tiab] OR "underdeveloped economies"[tiab] OR "middle income economy"[tiab] OR "middle income economies"[tiab] OR "low income economy"[tiab] OR "low income economies"[tiab] OR "lower income economy"[tiab] OR "lower income economies"[tiab] OR "low gdp"[tiab] OR "low gnp"[tiab] OR "low gross domestic"[tiab] OR "low gross national"[tiab] OR "lower gdp"[tiab] OR "lower gnp"[tiab] OR "lower gross domestic"[tiab] OR "lower gross national"[tiab] OR lmic[tiab] OR lmic[tiab] OR "third world"[tiab] OR "lami country"[tiab] OR "lami countries"[tiab] OR "transitional country"[tiab] OR "transitional countries"[tiab]

#8 Search "developing country"[ot] OR "developing countries"[ot] OR "developing nation"[ot] OR "developing nations"[ot] OR "developing population"[ot] OR "developing populations"[ot] OR "developing world"[ot] OR "less developed country"[ot] OR "less developed countries"[ot] OR "less developed nation"[ot] OR "less developed nations"[ot] OR "less developed population"[ot] OR "less developed populations"[ot] OR "less developed world"[ot] OR "lesser developed country"[ot] OR "lesser developed countries"[ot] OR "lesser developed nation"[ot] OR "lesser developed nations"[ot] OR "lesser developed population"[ot] OR "lesser developed populations"[ot] OR "lesser developed world"[ot] OR "under developed country"[ot] OR "under developed countries"[ot] OR "under developed nation"[ot] OR "under developed nations"[ot] OR "under developed population"[ot] OR "under developed populations"[ot] OR "under developed world"[ot] OR "underdeveloped country"[ot] OR "underdeveloped countries"[ot] OR "underdeveloped nation"[ot] OR "underdeveloped nations"[ot] OR "underdeveloped population"[ot] OR "underdeveloped populations"[ot] OR "underdeveloped world"[ot] OR "middle income country"[ot] OR "middle income countries"[ot] OR "middle income nation"[ot] OR "middle income nations"[ot] OR "middle income population"[ot] OR "middle income populations"[ot] OR "low income country"[ot] OR "low income countries"[ot] OR "low income nation"[ot] OR "low income nations"[ot] OR "low income population"[ot] OR "low income populations"[ot] OR "lower income country"[ot] OR "lower income countries"[ot] OR "lower income nation"[ot] OR "lower income nations"[ot] OR "lower income population"[ot] OR "lower income populations"[ot] OR "underserved country"[ot] OR "underserved countries"[ot] OR "underserved nation"[ot] OR "underserved nations"[ot] OR "underserved population"[ot] OR "underserved populations"[ot] OR "underserved world"[ot] OR "under served country"[ot] OR "under served countries"[ot] OR "under served nation"[ot] OR "under served nations"[ot] OR "under served population"[ot] OR "under served populations"[ot] OR "under served world"[ot] OR "deprived country"[ot] OR "deprived countries"[ot] OR "deprived nation"[ot] OR "deprived nations"[ot] OR "deprived population"[ot] OR "deprived populations"[ot] OR "deprived world"[ot] OR "poor country"[ot] OR "poor countries"[ot] OR "poor nation"[ot] OR "poor nations"[ot] OR "poor population"[ot] OR "poor populations"[ot] OR "poor world"[ot] OR "poorer country"[ot] OR "poorer countries"[ot] OR "poorer nation"[ot] OR "poorer nations"[ot] OR "poorer population"[ot] OR "poorer populations"[ot] OR "poorer world"[ot] OR "developing economy"[ot] OR "developing economies"[ot] OR "less developed economy"[ot] OR "less developed economies"[ot] OR "lesser developed economy"[ot] OR "lesser developed economies"[ot] OR "under developed economy"[ot] OR "under developed economies"[ot] OR "underdeveloped economy"[ot] OR "underdeveloped economies"[ot] OR "middle income economy"[ot] OR "middle income economies"[ot] OR "low income economy"[ot] OR "low income economies"[ot] OR "lower income economy"[ot] OR "lower income economies"[ot] OR "low gdp"[ot] OR "low

gnp"[ot] OR "low gross domestic"[ot] OR "low gross national"[ot] OR "lower gdp"[ot] OR "lower gnp"[ot] OR "lower gross domestic"[ot] OR "lower gross national"[ot] OR lmic[ot] OR lmic[ot] OR "third world"[ot] OR "lami country"[ot] OR "lami countries"[ot] OR "transitional country"[ot] OR "transitional countries"[ot]

#7 Search Africa[pl] OR Asia[pl] OR Caribbean[pl] OR West Indies[pl] OR South America[pl] OR Latin America[pl] OR Central America[pl] OR Afghanistan[pl] OR Albania[pl] OR Algeria[pl] OR Angola[pl] OR Antigua[pl] OR Barbuda[pl] OR Argentina[pl] OR Armenia[pl] OR Armenian[pl] OR Aruba[pl] OR Azerbaijan[pl] OR Bahrain[pl] OR Bangladesh[pl] OR Barbados[pl] OR Benin[pl] OR Byelarus[pl] OR Byelorussian[pl] OR Belarus[pl] OR Belorussian[pl] OR Belorussia[pl] OR Belize[pl] OR Bhutan[pl] OR Bolivia[pl] OR Bosnia[pl] OR Herzegovina[pl] OR Hercegovina[pl] OR Botswana[pl] OR Brasil[pl] OR Brazil[pl] OR Bulgaria[pl] OR Burkina Faso[pl] OR Burkina Fasso[pl] OR Upper Volta[pl] OR Burundi[pl] OR Urundi[pl] OR Cambodia[pl] OR Khmer Republic[pl] OR Kampuchea[pl] OR Cameroon[pl] OR Cameroons[pl] OR Cameron[pl] OR Camerons[pl] OR Cape Verde[pl] OR Central African Republic[pl] OR Chad[pl] OR Chile[pl] OR China[pl] OR Colombia[pl] OR Comoros[pl] OR Comoro Islands[pl] OR Comores[pl] OR Mayotte[pl] OR Congo[pl] OR Zaire[pl] OR Costa Rica[pl] OR Cote d'Ivoire[pl] OR Ivory Coast[pl] OR Croatia[pl] OR Cuba[pl] OR Cyprus[pl] OR Czechoslovakia[pl] OR Czech Republic[pl] OR Slovakia[pl] OR Slovak Republic[pl] OR Djibouti[pl] OR French Somaliland[pl] OR Dominica[pl] OR Dominican Republic[pl] OR East Timor[pl] OR East Timur[pl] OR Timor Leste[pl] OR Ecuador[pl] OR Egypt[pl] OR United Arab Republic[pl] OR El Salvador[pl] OR Eritrea[pl] OR Estonia[pl] OR Ethiopia[pl] OR Fiji[pl] OR Gabon[pl] OR Gabonese Republic[pl] OR Gambia[pl] OR Gaza[pl] OR Georgia Republic[pl] OR Georgian Republic[pl] OR Ghana[pl] OR Gold Coast[pl] OR Greece[pl] OR Grenada[pl] OR Guatemala[pl] OR Guinea[pl] OR Guam[pl] OR Guiana[pl] OR Guyana[pl] OR Haiti[pl] OR Honduras[pl] OR Hungary[pl] OR India[pl] OR Maldives[pl] OR Indonesia[pl] OR Iran[pl] OR Iraq[pl] OR Isle of Man[pl] OR Jamaica[pl] OR Jordan[pl] OR Kazakhstan[pl] OR Kazakh[pl] OR Kenya[pl] OR Kiribati[pl] OR Korea[pl] OR Kosovo[pl] OR Kyrgyzstan[pl] OR Kirghizia[pl] OR Kyrgyz Republic[pl] OR Kirghiz[pl] OR Kirgizstan[pl] OR "Lao PDR"[pl] OR Laos[pl] OR Latvia[pl] OR Lebanon[pl] OR Lesotho[pl] OR Basutoland[pl] OR Liberia[pl] OR Libya[pl] OR Lithuania[pl]

#6 Search Macedonia[pl] OR Madagascar[pl] OR Malagasy Republic[pl] OR Malaysia[pl] OR Malaya[pl] OR Malay[pl] OR Sabah[pl] OR Sarawak[pl] OR Malawi[pl] OR Nyasaland[pl] OR Mali[pl] OR Malta[pl] OR Marshall Islands[pl] OR Mauritania[pl] OR Mauritius[pl] OR Agalega Islands[pl] OR Mexico[pl] OR Micronesia[pl] OR Middle East[pl] OR Moldova[pl] OR Moldovia[pl] OR Moldovian[pl] OR Mongolia[pl] OR Montenegro[pl] OR Morocco[pl] OR Ifni[pl] OR Mozambique[pl] OR Myanmar[pl] OR Myanma[pl] OR Burma[pl] OR Namibia[pl] OR Nepal[pl] OR Netherlands Antilles[pl] OR New Caledonia[pl] OR Nicaragua[pl] OR Niger[pl] OR Nigeria[pl] OR Northern Mariana Islands[pl] OR Oman[pl] OR Muscat[pl] OR Pakistan[pl] OR Palau[pl] OR Palestine[pl] OR Panama[pl] OR Paraguay[pl] OR Peru[pl] OR Philippines[pl] OR Philipines[pl] OR Phillipines[pl] OR Phillippines[pl] OR Poland[pl] OR Portugal[pl] OR Puerto Rico[pl] OR Romania[pl] OR Rumania[pl] OR Roumania[pl] OR Russia[pl] OR Russian[pl] OR Rwanda[pl] OR Ruanda[pl] OR Saint Kitts[pl] OR St Kitts[pl] OR Nevis[pl] OR Saint Lucia[pl] OR St Lucia[pl] OR Saint Vincent[pl] OR St Vincent[pl] OR Grenadines[pl] OR Samoa[pl] OR Samoan Islands[pl] OR Navigator Island[pl] OR Navigator Islands[pl] OR Sao Tome[pl] OR Saudi Arabia[pl] OR Senegal[pl] OR Serbia[pl] OR Monte negro[pl] OR Seychelles[pl] OR Sierra Leone[pl] OR Slovenia[pl] OR Sri Lanka[pl] OR Ceylon[pl] OR Solomon Islands[pl]

OR Somalia[pl] OR South Africa[pl] OR Sudan[pl] OR Suriname[pl] OR Surinam[pl] OR Swaziland[pl] OR Syria[pl] OR Tajikistan[pl] OR Tadzhikistan[pl] OR Tadjikistan[pl] OR Tadjik[pl] OR Tanzania[pl] OR Thailand[pl] OR Togo[pl] OR Togolese Republic[pl] OR Tonga[pl] OR Trinidad[pl] OR Tobago[pl] OR Tunisia[pl] OR Turkey[pl] OR Turkmenistan[pl] OR Turkmen[pl] OR Uganda[pl] OR Ukraine[pl] OR Uruguay[pl] OR USSR[pl] OR Soviet Union[pl] OR Union of Soviet Socialist Republics[pl] OR Uzbekistan[pl] OR Uzbek OR Vanuatu[pl] OR New Hebrides[pl] OR Venezuela[pl] OR Vietnam[pl] OR Viet Nam[pl] OR West Bank[pl] OR Yemen[pl] OR Yugoslavia[pl] OR Zambia[pl] OR Zimbabwe[pl] OR Rhodesia[pl]

#5 Search Africa[tiab] OR Asia[tiab] OR Caribbean[tiab] OR West Indies[tiab] OR South America[tiab] OR Latin America[tiab] OR Central America[tiab] OR Afghanistan[tiab] OR Albania[tiab] OR Algeria[tiab] OR Angola[tiab] OR Antigua[tiab] OR Barbuda[tiab] OR Argentina[tiab] OR Armenia[tiab] OR Armenian[tiab] OR Aruba[tiab] OR Azerbaijan[tiab] OR Bahrain[tiab] OR Bangladesh[tiab] OR Barbados[tiab] OR Benin[tiab] OR Byelarus[tiab] OR Byelorussian[tiab] OR Belarus[tiab] OR Belorussian[tiab] OR Belorussia[tiab] OR Belize[tiab] OR Bhutan[tiab] OR Bolivia[tiab] OR Bosnia[tiab] OR Herzegovina[tiab] OR Hercegovina[tiab] OR Botswana[tiab] OR Brasil[tiab] OR Brazil[tiab] OR Bulgaria[tiab] OR Burkina Faso[tiab] OR Burkina Fasso[tiab] OR Upper Volta[tiab] OR Burundi[tiab] OR Urundi[tiab] OR Cambodia[tiab] OR Khmer Republic[tiab] OR Kampuchea[tiab] OR Cameroon[tiab] OR Cameroons[tiab] OR Cameron[tiab] OR Camerons[tiab] OR Cape Verde[tiab] OR Central African Republic[tiab] OR Chad[tiab] OR Chile[tiab] OR China[tiab] OR Colombia[tiab] OR Comoros[tiab] OR Comoro Islands[tiab] OR Comores[tiab] OR Mayotte[tiab] OR Congo[tiab] OR Zaire[tiab] OR Costa Rica[tiab] OR Cote d'Ivoire[tiab] OR Ivory Coast[tiab] OR Croatia[tiab] OR Cuba[tiab] OR Cyprus[tiab] OR Czechoslovakia[tiab] OR Czech Republic[tiab] OR Slovakia[tiab] OR Slovak Republic[tiab] OR Djibouti[tiab] OR French Somaliland[tiab] OR Dominica[tiab] OR Dominican Republic[tiab] OR East Timor[tiab] OR East Timur[tiab] OR Timor Leste[tiab] OR Ecuador[tiab] OR Egypt[tiab] OR United Arab Republic[tiab] OR El Salvador[tiab] OR Eritrea[tiab] OR Estonia[tiab] OR Ethiopia[tiab] OR Fiji[tiab] OR Gabon[tiab] OR Gabonese Republic[tiab] OR Gambia[tiab] OR Gaza[tiab] OR Georgia Republic[tiab] OR Georgian Republic[tiab] OR Ghana[tiab] OR Gold Coast[tiab] OR Greece[tiab] OR Grenada[tiab] OR Guatemala[tiab] OR Guinea[tiab] OR Guam[tiab] OR Guiana[tiab] OR Guyana[tiab] OR Haiti[tiab] OR Honduras[tiab] OR Hungary[tiab] OR India[tiab] OR Maldives[tiab] OR Indonesia[tiab] OR Iran[tiab] OR Iraq[tiab] OR Isle of Man[tiab] OR Jamaica[tiab] OR Jordan[tiab] OR Kazakhstan[tiab] OR Kazakh[tiab] OR Kenya[tiab] OR Kiribati[tiab] OR Korea[tiab] OR Kosovo[tiab] OR Kyrgyzstan[tiab] OR Kirghizia[tiab] OR Kyrgyz Republic[tiab] OR Kirghiz[tiab] OR Kirgizstan[tiab] OR "Lao PDR"[tiab] OR Laos[tiab] OR Latvia[tiab] OR Lebanon[tiab] OR Lesotho[tiab] OR Basutoland[tiab] OR Liberia[tiab] OR Libya[tiab] OR Lithuania[tiab]

#4 Search Macedonia[tiab] OR Madagascar[tiab] OR Malagasy Republic[tiab] OR Malaysia[tiab] OR Malaya[tiab] OR Malay[tiab] OR Sabah[tiab] OR Sarawak[tiab] OR Malawi[tiab] OR Nyasaland[tiab] OR Mali[tiab] OR Malta[tiab] OR Marshall Islands[tiab] OR Mauritania[tiab] OR Mauritius[tiab] OR Agalega Islands[tiab] OR Mexico[tiab] OR Micronesia[tiab] OR Middle East[tiab] OR Moldova[tiab] OR Moldovia[tiab] OR Moldovian[tiab] OR Mongolia[tiab] OR Montenegro[tiab] OR Morocco[tiab] OR Ifni[tiab] OR Mozambique[tiab] OR Myanmar[tiab] OR Myanma[tiab] OR Burma[tiab] OR Namibia[tiab] OR Nepal[tiab] OR Netherlands Antilles[tiab] OR New Caledonia[tiab] OR Nicaragua[tiab] OR Niger[tiab] OR Nigeria[tiab] OR Northern Mariana Islands[tiab] OR Oman[tiab] OR Muscat[tiab] OR Pakistan[tiab] OR Palau[tiab] OR

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Part B: Literature Review

Introduction

The last twenty years has seen significant progress in our understanding of the impact of a young child's caregiving environment on their development, health and wellbeing (Shonkoff et al., 2012; Shonkoff, 2016). From birth, a baby's brain begins to develop at a rapid rate in response to the experiences that it has had (Britto et al., 2015). These experiences determine the development of neural structures and chemistry of that infant's brain for the rest of their life. In infancy a child is with their caregiver for considerably more time than at any stage of life (Bornstein, 2002). As such, the caregiver has significant influence over the infant's environment and development. Research has determined that the brain has the most capacity to change and develop in the first years of life, and that this ability diminishes with age (Shonkoff et al., 2012). This neuroplasticity creates an ideal opportunity to intervene earlier rather than later to support the realisation of the child's developmental potential (Shonkoff, 2010). Research consistently demonstrates that infants who have a caregiver that is containing and consistent are much more likely to have optimal development (Shonkoff, 2010). Sensitive parenting has been shown to mitigate considerable risks to child development, even if the wider environment is less than ideal (Alto and Petrenko, 2017; Luby, 2015; Bernard et al., 2013).

In this literature review I will begin by outlining the key concepts relevant to understanding responsive caregiving and attachment, as well as illustrate their importance to child development. I will then go on to critically appraise existing reviews of responsive caregiving and attachment. In so doing, I will highlight the gaps in the literature that call for this systematic review to be conducted.

Key Concepts

There are a few key concepts that require further clarification and will give context to the rest of the review and the subject area as a whole. The first of which is:

Responsiveness, this is defined as “mothers’ prompt, contingent, and appropriate behaviours” (Bornstein and Tamis-LeMonda, 1997; Eshel et al., 2006a). Ainsworth (1964) conceptualised responsivity as harmony between the infant need and the caregiver response. Responsive caregiving can be broken down into three component parts: observation, interpretation and prompt and appropriate action (Eshel et al., 2006a; Oates, 2007; Landry et al., 2006). Observation consists of noticing the infant’s different vocalisations, behaviour and body changes that the infant uses to communicate to the caregiver (Richter, 2004b; Bornstein et al., 2012b). Interpretation is accurately understanding much of the time what need the infant is communicating. Appropriate action is where the infant can be reassured that their communication has been heard and their needs are being consistently and reliably met (Landry et al., 2006). A caregiver who is attuned and responsive also helps the infant begin to gain an understanding of self, and the effect that they can have on their environment (Bigelow, 1998). The successful two-way interaction between caregiver and infant also supports the infant’s sense of being loved and valued. In much of the literature the terms “responsivity” and “sensitivity” are used interchangeably and the Draft Global Framework on Nurturing Care (WHO, 2018) identifies sensitivity and responsivity as the two aspects of responsive caregiving.

When infants are born they have limited ability to be able to regulate their emotions independently and need co-regulation from their caregiver (Sroufe, 2000). Infant communication in the form of eye contact, crying, facial expressions and body language should induce caregivers to meet their needs, take control of the situation, contain them and keep them

safe in moments of distress (Coan, 2008). Outside of these “crises” there is a series of back and forth exchanges between caregiver and infant where there is mirroring and vocalisations between the infant and caregiver that lay the foundations for future social reciprocity (Sroufe, 2000). In LMICs, even in the general population, there are many factors that can interfere with the development of this dynamic which makes being a responsive caregiver very challenging. These factors include poverty, violence, food insecurity and poor caregiver physical or mental health (Richter, 2004b; Britto et al., 2015), yet in these environments infants need protection and care more than ever because they are so vulnerable. In the South African context all these factors are present in communities and families to a greater or lesser extent which may impact on a caregiver’s ability to be caring and responsive (Cooper et al., 1999; Dowdall et al., 2017), and consequently their ability to form an attachment with their infant.

Attachment: The suggestion of a link between caregiver sensitivity and attachment arose in the work of John Bowlby in the 1950s, and was scrutinised further by Mary Ainsworth in the 1970s when she studied a group of infants in the United States and another group in Uganda for considerable periods of time in the first 5 years of life. (Wolff and Ijzendoorn, 1997; Ainsworth and Bell, 1970). Her study found a very strong association between caregiver sensitivity and attachment. Despite the fact Ainsworth’s early studies have been questioned due to her small sample size, her hypothesis has been supported in many other studies such as a meta-analysis of 66 studies where it was found that sensitivity plays a significant but not exclusive role in attachment security (Wolff and Ijzendoorn, 1997).

Caregivers who are sensitive and responsive, but not overly intrusive typically develop secure attachments with their infants whilst infants who are in the care of unpredictable, insensitive or intrusive caregivers are more likely to develop an insecure or avoidant style of attachment. A warm and caring caregiver does not necessarily guarantee a secure attachment as the crucial aspect is that the caregiver must be responsive to what the child needs and wants (Bornstein,

2002). To understand the importance of attachment and the need to facilitate a secure attachment, it is valuable to pinpoint exactly what attachment is.

An attachment is a dynamic and mutual connection between caregiver and infant that develops in the first year of life (Ainsworth, 1964; Sroufe, 2000). Its purpose is for the caregiver to protect the child in the face of danger and the child to seek the caregiver in any challenging circumstances and be reassured and contained by the caregiver. When a caregiver is consistently and appropriately responsive the infant becomes confident of the caregiver's ability to restore the status quo and the infant feels secure and settled (Sroufe, 2000). The functions of the attachment between caregiver and infant are comfort, care, emotional warmth and emotional regulatory support (Zeanah et al., 2011). The infant's first relationships are internalised and create their future expectations of relationships, and understanding of how their needs can be met by another (Richter, 2004b). Although most children will have one primary caregiver with whom they have an attachment relationship, they may well have additional attachments with a second parent, grandparent, paid caregiver or sibling so the child can have some secure attachments and some insecure attachments depending on the caregiving quality within each relationship (Benoit, 2004). Although caregiving varies between cultures, attachment has been shown to be present cross-culturally (Alto and Petrenko, 2017; Oates, 2007; Posada et al., 2002; Bornstein et al., 2012a).

A secure attachment enables the infant to feel confident to explore their surroundings (Benoit, 2004; Sullivan et al., 2011; Ainsworth, 1979). Attachment develops in stages as described by Ainsworth (1964). Although infants are able to distinguish their mothers immediately post-partum (Sullivan et al., 2011) they are indiscriminating in their first 3 months of life and will respond to most interactions. As their skills develop they begin to be able to discern between their primary caregiver and other caregivers. By the time an infant is at an age where they are mobile (around 7 months) they have become more cautious of others and their specific

attachment to a primary caregiver is obvious. The final stage of the development of attachment is where the close attachment to the primary caregiver remains obvious but the infant also has bonds with other people in their lives such as siblings or grandparents.

Although attachment is something that should emerge in typical development there is a need to assess whether an infant is securely attached. Researchers have devised a number of assessments, the most famous of which is the Strange Situation Procedure by Ainsworth (Ainsworth, 1964) where she conceived three classifications of attachment: Secure, Insecure Avoidant and Insecure Resistant (Benoit, 2004). These classifications are all categorised as organised: that is, the infant has a consistent way in which they respond under stress. Secure infants have reliable caregivers who respond appropriately to them. This predictability builds a connection between the infant and caregiver, and the infant will always look to the caregiver in times of stress. Insecure avoidant infants are likely to have been cared for in an inconsistent manner. Instead of seeking a caregiver in times of stress, they actively avoid their caregiver. The third and final classification devised by Ainsworth was the Insecure Resistant classification where an infant is likely to have had a caregiver who has been insensitive to their needs, perhaps putting their own needs first or having limited capacity to cope. In this case the infant expresses themselves in an exaggerated manner to try and ensure that their needs are met. Initially only these classifications were used until the 1990s when the concept of disorganised attachment emerged (Granqvist et al., 2017; Bakermans-Kranenburg et al., 2005; Van Ijzendoorn et al., 1999). This style of attachment arises in situations where caregivers have continually unpredictable behaviour that is stressful for the infant. When the infant encounters a novel situation that is stressful they feel uncertain how to respond as they experience the caregiver as a source of stress too. In assessment this looks like an infant seemingly not responding in a stressful situation or behaving unusually. Usually disorganised infants are seen in high risk populations.

Attachment is frequently confused with bonding in the literature and is often incorrectly used synonymously. Unlike attachment which has significant effects on the infant through their life in terms of mental health, academic success, social skills and resilience (Cooper et al., 2009c; Alto and Petrenko, 2017), bonding is a theory devised by Klaus and Kennell (1982) as cited in Benoit (2004) that suggested early skin to skin contact with the caregiver immediately post-partum was required for positive development (Benoit, 2004; Kinsey and Hupcey, 2013). Bonding reflects the caregiver's connection to the infant where attachment is typically viewed as the infant's connection to the caregiver. Attachment is an essential part of positive child development, resilience and child mental health (Alto and Petrenko, 2017). It is vital that interventions are devised and implemented in child health services to support responsivity and attachment.

Interventions to support responsive caregiving and attachment

Both attachment and responsivity do not necessarily arise naturally in the caregiver-infant relationship, especially where there are other adversities at play. Consequently, there have been a range of interventions that have been developed to attempt to facilitate the caregiver-infant relationship. Many of the studies that have been undertaken have looked at interventions to support special populations such as pre-term infants (Ravn et al., 2011), drug addicted mothers (Suchman et al., 2011), homeless caregivers (Kelly et al., 2000) and orphans (McCall et al., 2010). This systematic review conducted for the purposes of this mini-dissertation seeks to explore interventions in a more general population in low and middle- income settings. The literature search revealed that there are already several reviews that examine responsivity and attachment interventions in low and middle-income settings. I will now examine the most significant reviews to identify both the findings of the reviews, but also any methodological issues that may impact on reliability and usefulness of the study.

WHO Reviews (2004 &2006)

The WHO have acknowledged the link between caregiving, attachment and health since 1951 when they commissioned a study by John Bowlby to look at the effects of caregiver and infant separation during the war (Richter, 2004b). In 2004 the WHO acknowledged that for too long the emphasis had been on child survival and that child health strategy had not adequately acknowledged the role of the caregiver-infant relationship on child health. With this in mind they commissioned an extensive review in 2004 (Richter) that examined the evidence of the relationship between responsive caregiving and positive child development. The review summarised the theory behind attachment and responsivity but did not cover interventions. Following this, there was an additional WHO review in 2006 (Eshel et al., 2006a) that focused on both the benefits of responsive caregiving and interventions that support responsive caregiving. The review used a wide variety of databases (7), but only studies conducted in English were included which introduced a language bias. The review was due to focus on developing countries, but there were insufficient results generated in their searches, so the scope was extended to include studies from both developed and developing countries. The methods of the review were in parts vague and suggested some methodological challenges with considerable risk of selection bias. The review stated that authors “chose 50 articles that were representative examples of articles in each section” which does not suggest a systematic application of the inclusion criteria. Furthermore, their data extraction methods were not clearly stated. The Authors also did not state how many reviewers participated in the study, again risking bias in their review findings.

Although Eshel et al (2006) separately analysed developed and developing countries, the section on developing countries was very limited. The studies included had a variety of outcomes such as language, cognition and responsive caregiving. The review included studies

of special populations such as low birth weight infants. The results of the special population studies were combined in the synthesis of findings despite the fact there are likely to be many confounding factors within a special population study that would influence the outcome. They also do not detail the age parameters of the children which could also have a considerable effect on interventions and results. This review combines studies of different populations (special populations, different ages, different settings), measuring different outcomes (cognition, language, responsivity, physical growth) and then attempts to make inferences. The review reported moderate results for responsive caregiving interventions on a range of outcomes such as physical growth, health and child development and resulted in a recommendation that responsive caregiving interventions be integrated into child health programmes.

The WHO reviews are useful as they provide solid evidence of the value of responsivity and attachment to child development and other health outcomes. Where they are limited and create a gap in the literature is that they have very little focus on LMIC.

The WHO reviews seemed to be a catalyst for a focus on child development in public health. Shortly after Eshel et al's review was the first of the Lancet series on Child Development in 2007 and again in 2011, 2016 and 2017 (Daelmans et al., 2017). Other drivers were the increasing evidence from the fields of neuroscience and biology that demonstrated the effects of early relationships on neural development and genetic expression.

Lancet Reviews (2011 & 2017)

The Lancet series were broad in their focus and examined a wide range of child development outcomes. Engle et al (2011a) conducted a review that looked at a range of outcomes around inequality in LMICs, one of which explored parenting interventions to promote parent-child

interaction. The study used a wide range of sources and included studies reported in both English and Spanish. They included studies that met a pre-determined standard as assessed using a public health quality assessment tool with a sample size of over 50. There were 15 studies included in their sub-review of parenting interventions which had overwhelmingly positive outcomes, especially in interventions that included parents and children. Caregiver-infant relationship interventions were only in two of the included studies, whilst the other studies focused on other areas such as pre-school provision, nutrition, prevention of mother to child transmission of HIV and breastfeeding. Having only two relevant studies does not generate information that is generalizable. There is also no mention of the age of the study participants ie. Were they infants? The broader inclusion age of the whole review across all outcomes was 0-5 years old. It is stated that effects tended to be greater for younger than older children highlighting the need for a review to focus on interventions for the younger age group.

Engle et al (2011) umbrella review (of which the above discussed parenting review is one part), gives the appearance of being substantial as they include 42 studies; however they have grouped together quite different study designs and interventions that also have wide-ranging outcomes so on an individual outcome level the number of studies is considerably smaller. Even within the sub-review of parenting interventions the authors grouped cognitive and social-emotional development (9 studies) as one outcome when they are two distinctly different outcomes that are likely to draw on different theories of change. Therefore, it is difficult to elucidate information that pertains specifically to outcomes of responsivity and attachment as the grouping is too imprecise. Other outcomes included in the parenting interventions sub-review included home stimulation, learning activities and parent knowledge (2 studies). In reviews that explore such a wide range of outcomes there is inadequate space to discuss what

the interventions entail, what they are measuring and whether there is a uniform understanding of concepts across the studies.

In addition to the fact that interventions reviewed were diverse, levels of intervention intensity also varied widely in the included studies (2 sessions-100 sessions). The review found that the intensity of the intervention did not correlate with the intervention's efficacy which is a different finding from some of the other reviews. The review included studies that had a range of methods of delivery such as home visits, groups, clinic based programmes and use of media although they did not indicate what number of studies used each modality. The review identified key aspects of successful interventions as sufficient training of those that were delivering the intervention and combined interventions where parenting support is combined with meeting other needs. This is a consistent finding across the reviews.

The Lancet had another review a number of years later in 2017 (Black et al.) which was again broad in scope. It investigated progress in early childhood development that included a range of outcomes, one of which was responsive caregiving. As it was not a systematic review, there was no methodology detailed. The studies they referenced all have outcomes of child development or growth, rather than responsivity or attachment but they had positive effects and were delivered through a range of methods (home visiting, group sessions and health centre programmes). The Lancet studies, besides being a call to action, have very limited practical use for programme design because both the intervention and outcome focus is too broad and there is inadequate detail. From both reviews we can deduce little about interventions that support responsivity and attachment.

UNICEF review (2015)

The strong evidence of the effects of caregiving in the early years, combined with a drive around child rights led to the initiation of the UNICEF review (Britto et al., 2015). The

systematic review was large and included 105 studies on parenting (Britto, 2015). The review was conducted by several well-known child development experts. The study had a wide age parameter of 0-8 years old, but also a broad remit of assessing parenting interventions that target a variety of outcomes: hygiene, breastfeeding, nutrition, neonatal mortality, oral health, social protection, injury prevention, cognition, language and psychosocial outcomes. They chose to include some special populations such as low birth weight infants, preterm infants where they felt the condition was reversible, but excluded others such as congenital abnormality where the condition was enduring. They excluded any programmes that were started in the prenatal period and the inclusion criteria stipulated that the studies had to have at least 100 participants. They included the sample size criteria to ensure that there would be generalisability of findings but having such a large sample cut off means that the studies would have had to be very well funded, which means that smaller local studies would have been excluded which could introduce bias.

This review also highlighted the challenge of identifying literature as this topic falls within the academic disciplines of psychology, education, social science, economics and health. The studies that were included had very positive outcomes overall. This provided good evidence for the efficacy of parenting interventions and suggested that longer programmes (12 months or more) are more effective, as are the programmes that are delivered with greater frequency. It was also found that having both caregiver and child present to practice the intervention yielded the best outcomes. The review also concluded that the more methods employed to effect behaviour change, the more successful the intervention. Professional staff were also more successful in effecting change than unqualified staff like community health workers. The findings should be viewed in light of the fact that the review is exploring a wide range of parenting outcomes, only one of which is responsive caregiving and attachment as well as

interventions with children up to age 5. What may be effective with parents with pre-schoolers may be quite different to new parents with a baby and so combining so many outcomes may distort results.

The UNICEF review confined their search terms to studies between 2001-2011. Although their criteria stated that they included grey literature they excluded editorials and notes, dissertations, letters, case series, conference papers, and books which is a large proportion of the grey literature so there is still therefore some risk of publication bias. They reviewed materials in English and Spanish as there are increasing numbers of studies in Latin American countries, but limiting to only two languages introduced a language bias which is not justifiable in a multinational resourced organisation like UNICEF.

The strengths of the review were that they contacted authors to fill in missing data to reduce bias. The authors also used many academic databases (10), followed up key informants to find other unpublished reports and reviewed many agency websites for further programme evaluations. Where the authors were somewhat biased in their outcomes is that they included specific intervention types in the search terms which may have limited what results arose. Another methodological strength was the use of two reviewers who had substantial agreement as well as double coding on 15% of studies. They devised their own quality review system that addressed the question of cultural applicability. Their systematic review combined studies from all income countries (approximately a third from each income level), but then they did do stratified analysis on a country income basis. Out of the 105 included studies, only 3 focused on psychosocial stimulation and responsiveness (the area of focus for this systematic review). The review was useful in identifying that key components of interventions consist of dose (duration, frequency, intensity), modality, service provision (who is delivering the intervention), timing of the programme.

Other reviews

Perhaps the most referenced review in the literature is by Bakermans-Kranenburg et al (2003). The study was published 15 years ago and there has been a considerable amount of research since that time. The aim of the meta-analysis was to establish via experimental studies alone the effect that parenting has on development, and which interventions are most successful. This study is probably the most rigorous of the reviews presented here due to the large number of included studies and the way in which they compared different intervention types to assess for efficacy. This review addressed the key question of the considerable difference in intensity of intervention and how that relates to outcome. The authors utilised 3 key databases with broad based terms to prevent bias, as well as book and article reference lists and consultations with experts in the field. Interventions had to commence before the child was 54 months old (4.5 years). They included studies that had reliable and valid outcome measures (eg. HOME, Ainsworth Sensitivity Scales etc..) and excluded studies with self-report measures.

The meta-analysis included 70 published papers that examined 88 interventions. The authors used a detailed coding system that separated design and all aspects of the sample such as size, characteristics of population and risk factors. They also coded all intervention details including the number of sessions, the age of the child, what qualification the service provider had and where the intervention took place. The authors used the coding system to identify risks to bias and coded for randomisation procedures, whether the study had control groups, how much attrition there had been and how this was handled in the analysis. Helpfully they also identified in their coding system the aims of each intervention, be they increased responsivity, sensitivity or attachment. Like the previous reviews this analysis included many studies with special populations (pre-term infants, depressed mothers, adopted children etc..). The analysis found

that studies aiming to improve sensitivity were more successful than those aiming to alter attachment, although some of the sensitivity intervention studies did alter attachment. Few studies had any negative effects. The evidence suggested less intensity was better, and that commencing interventions once the infant was 6 months old or older was also more effective (they had excluded any prenatal studies which could have biased this finding). Although the study was well devised in many ways, it was written up in a way that would make it difficult to be used for practically designing an intervention to enhance responsiveness or attachment. The age of the study also reduces its use, although it is still a useful study to consider.

The final review is a recent one undertaken by Mountain et al (2017) who looked at interventions to support sensitivity and attachment. The mean age of the participants was 36 months (3 years) suggesting many the studies had children outside of infancy. The fact that the study divided its results between North American studies and African studies was helpful in interpreting the findings. It is somewhat restrictive that they only considered English language studies and this may account for why there was a limited number of studies. It is also interesting that their searches yielded no European, Asian or South American articles, but perhaps this limited yield is related to how few databases they accessed, their choice of databases and the fact that they only used published literature. This meant they included only four studies, and just three were used in the meta-analysis. The review's conclusion was that there were improvements in sensitivity and attachment when the results were combined, and that the programmes affected attachment security, but not organisation. The study data was combined into a meta-analysis even though the studies were heterogeneous in most ways (duration, delivery mode, settings and modality). Given how small the sample is the value of the findings is questionable. The sample size is even smaller if one is to consider only the African component of the review (2 studies). The review has limited use to this study because the age of the participants is different to the scope of this review. So although there are a number of

reviews by well-known organisations, authors and publications it is clear that none is quite as specific as the study that is being proposed.

Concluding Remarks

Whilst there is convincing evidence that responsive caregiving has a considerable impact on neurological development, and has long term impacts on attachment and physical and mental health, the evidence around interventions is less clear. In this literature review I examined several reviews (systematic and otherwise) that had some consistent findings such as better effect sizes for programmes that included caregivers and infants rather than just caregivers and using qualified staff rather than community workers and employing a range of modalities. There was some inconsistency in findings with some reviews suggesting greater intensity yields greater results, and others finding that not to be true. Overall the reviews did demonstrate positive effects of interventions. However, in all the reviews the remit of the review was so broad, both in terms of outcome and intervention, to be meaningfully used in the formulation and design of intervention programmes that support responsive caregiving and attachment.

The aim of the systematic review (Part C) will be to narrow the variables such as age to only encompass infancy. The review will also confine the search to intervention studies that have taken place in LMICs so that it will be clearer what the key variables are within the intervention that impact on outcomes of responsiveness and attachment.

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Part C: Journal Article

This article has been prepared for submission to the Journal of Child Health Care. Author instructions are available online (<https://uk.sagepub.com/en-gb/afr/journal/journal-child-health-care#submission-guidelines>) as well as in Part D: Supplementary Material¹

Front Sheet

(as requested by the journal)

1. **Article type:** Systematic Review
2. **Corresponding author info:**

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3. Enabling responsive caregiving and secure attachment in low and middle-income countries: A systematic review of caregiver interventions in infancy
4. Authors

Kirsty A Gilmour

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5. Abstract (below)

¹ *There is a single deviation from journal requirements. For the purposes of the dissertation submission tables and figures are inserted in the text rather than put in the appendix.*

A Systematic Review of Caregiver Interventions in Infancy to Enable Responsive Caregiving and Secure Attachment in Low and Middle-Income Countries.

Abstract

The first 1000 days is recognised as the most sensitive period of development of an individual's life. Infants in low and middle-income countries face significant risks to their development during this period. Research confirms that having a responsive, caring relationship between the infant and caregiver is a considerable protective factor for infants, and results in better long-term outcomes in cognition, language, academic achievement, social skills and behaviour. The aim of this review was to systematically examine the literature to identify interventions in low and middle-income settings that influence infant-caregiver responsivity and attachment and explore the characteristics of the interventions that contribute to its efficacy. Ten electronic databases were searched (Pubmed, Scopus, PsycINFO, PsycARTICLES, Africa-Wide, CINAHL, Health Source, ERIC, SocINDEX & Cochrane Library), as well as hand searching relevant reference lists for published articles in the English language from 1969-2018. A total of 11 765 studies were identified through the search strategy and 24 studies were included in the review. The included studies were critically appraised and then coded descriptively to enable a narrative synthesis of findings. Studies were from low and middle-income countries in Africa, Asia, Europe and South America and consisted predominantly of randomized control trials, but also quasi-experimental studies and a single cohort and qualitative study were included. All but two studies found positive effects on responsivity, attachment or both. For ten of the studies this effect was significant. The findings suggest implementing individual or group interventions in LMICS has a positive effect on caregiver-infant relationships and can be delivered successfully by trained non-professional staff.

Key words: Parenting, responsive caregiving, attachment, caregiver sensitivity and low and middle-income countries

Introduction

Relationships are a core aspect of human development and experience (Sroufe, 2000; Newman et al., 2015). Infants are born with an ability to stimulate responses in adults that enable all their physical and emotional needs to be met. When these cues are responded to in a sensitive manner, the infant feels secure and safe. Through repeating this process many times, emotional regulation, self-awareness and stress management are developed (Music, 2010; Sroufe, 2000). Neuroimaging studies have shown that even in difficult circumstances of poverty, having a responsive caregiver eased the negative effects that poverty has on neural development (Luby et al., 2013). Conversely, when the caregiver is not attuned to the infant's needs and is unable to meet their demands consistently, there can be difficulty in forming a secure attachment (Music, 2010). This has also been demonstrated in primate and other animal models (Ainsworth and Bell, 1970; Hane and Fox, 2006). As well as being a protective factor for healthy brain development, sensitive and responsive caregiving are the key determinants of developing a secure attachment (Richter, 2004a).

Attachment is a connection between an infant and a caregiver (Oates, 2007). It can be demonstrated by a desire of the infant to be with the caregiver, feeling comforted by the caregiver and exhibiting distress when away from the caregiver (Newman et al., 2015; Richter, 2004a). This secure relationship enables the infant to interact with their environment assured that the caregiver is nearby (Dunst and Kassow, 2008; Posada et al., 2002). Secure attachment is a significant factor in normal development and has been found to be a predictor of social competence and resilience (Richter, 2004b). Conversely, children who have insecure attachment are more likely to have social and behavioural problems, cognitive difficulties and low self-esteem and are at higher risk of mental health problems (Oates, 2007; National Academies of Sciences and Medicine, 2016). This can have inter-generational implications

because caregivers who experienced insecure attachment as children may have difficulty forming secure attachments with their infants (Oates, 2007; IJzendoorn et al., 1995).

Most of the world's children live in low and middle-income countries (LMICs) and many face considerable risks to their development such as poverty, food insecurity, trauma, violence, substance abuse and mental illness (Stein et al., 2015). Caregivers living in more stressful environments have many immediate demands on their attention such as being safe and acquiring adequate resources (Tomlinson et al., 2005b) are more likely to have difficulty being sensitive towards their infant and it is more probable that they will need additional support to be able to engage in optimal caregiving (Cooper et al., 2009b). Despite the obvious need for relevant research and interventions in LMICs only a very small proportion of child development research is conducted in LMICs (Tomlinson et al., 2005b).

Research outputs like the Lancet Child Development series in 2007, 2011 & 2016 have underscored the importance of very early child development on longer term health outcomes (Daelmans et al., 2017). There is strong evidence supporting the relationship between responsiveness, attachment and child health outcomes (Richter, 2004b). There have been many experimental studies and reviews in high-income settings that have looked at interventions to support the development of responsiveness and attachment (Bakermans-Kranenburg et al., 2005; IJzendoorn et al., 1995; Letourneau et al., 2015). Interventions have included home visiting programmes with both highly skilled professionals and low skilled workers, parent-infant psychotherapy, baby massage, Video-feedback Intervention to promote Positive Parenting (VIPP), parenting groups, counselling and education sessions and written information for caregivers (Wright and Edginton, 2016; IJzendoorn et al., 1995). Some reviews have explored interventions to support responsiveness and attachment, but with outcomes of language

development and cognition (Aboud and Yousafzai, 2015). These studies have shown that interventions have an effect on responsiveness and attachment, as well as demonstrating that early intervention results in more stable families and stronger mental health (Black et al., 2017). However, the evidence is derived mainly from studies in high-income settings and all reviews have included studies of children aged 0-5. Given the evidence that the First 1000 days are the optimum time for neural development it seems pertinent that interventions should be preventative and take place within this period.

In LMICS, where it is acknowledged that risks to child development are considerably higher (Grantham-McGregor et al., 2007a) and the need for interventions to support responsive caregiving in infancy is highest (Lake, 2011), there has not yet been a systematic examination of interventions conducted in these settings. The purpose of this review is to meet that need and identify and critically appraise studies conducted in LMICs with caregivers and infants under 24 months within the general population. The review will also examine the characteristics of the interventions and their efficacy in making changes to responsiveness and attachment in infant-caregiver relationships in LMICs.

Methods

Search strategy

A comprehensive search of databases was conducted in consultation with subject specialist librarians of the following databases: Pubmed, Scopus, PsycINFO, PsycARTICLES, Africa-Wide, CINAHL, Health Source, ERIC, SocINDEX and the Cochrane Library from 1966-2018. The WHO IRIS was also searched for relevant documents and references as well as a systematic hand search of all reference lists of full text articles, reference lists of related reviews and publication lists of authors known to publish more broadly in this area. Grey literature was not included in the search strategy due to resource constraints. The search terms attempted to

balance sensitivity and specificity but the search terms were deliberately broad to attempt to capture a wide variety of interventions in a range of settings. The terms also included the Cochrane Filter for Low and Middle- Income Countries (LMICS) to attempt to capture studies conducted in LMICS. The search terms can be found in Additional Document 1. The search began in August 2017 and concluded in February 2018. RSS feeds were reviewed throughout that period. Initial screening of titles and abstracts was conducted by the first reviewer, utilising the software Rayyan for larger databases. In the next phase of screening full text articles, a second reviewer supported the process by reviewing 10% of included articles and 10% of full text excluded articles.

Inclusion and Exclusion Criteria

Studies were included in the review if they met the criteria identified in Table 1 below.

	Inclusion	Exclusion
Participants	Caregivers and infants <24 months old (including when interventions were commenced in utero) Mixed population	Children >24 months Special populations eg. HIV positive infants, drug addicts
Setting	Low and middle-income countries	High income countries
Publication dates	1966-2018	Before 1966
Publication status	Only published studies	Grey literature
Outcomes measured	Responsivity, sensitivity or attachment	Cognitive or language outcomes
Language	English	Any other language
Interventions	Intervention studies that include some details of the intervention such as intensity, staffing and content	Not an intervention Lacks any detail of the intervention

Table 2: Definition of Terms

Infant	A child aged from birth up until 24 months
Caregiver	The individual who is the primary carer for the infant.
Responsive caregiving	<i>“a mother’s/caregiver’s prompt, contingent and appropriate interaction with the child”</i> (Eshel, Daelmans, et al., 2006).
Secure Attachment	A bond between infant and caregiver which results in the infant being content in the caregiver’s presence, the infant seeking out the caregiver and having pleasure in the relationship with the caregiver (Phillips & Shonkoff, 2000)
Low and middle-income countries	A term defined by the World Bank who group countries into one of four income categories: low, low-middle, upper-middle and high income. This grouping is based on a per capita income (World Bank, 2017).

Study quality assessment

Studies were critically appraised using the Joanna Briggs Institute (JBI) tools for each study design. The tools comprehensively assess how bias has been controlled in the study design, as well as a broader assessment of quality. The review is a mixed methods design that includes RCTs, quasi-experimental designs, a cohort study and a qualitative design. The range of methodologies employed in the included studies made it difficult to compare, and therefore exclude based on quality. Table 4, 5, 6 & 7 detail all the appraisal outcomes by study design and the appraisal scores are also repeated in the intervention table (Table 3).

Data extraction and synthesis

A data extraction tool was designed to capture key descriptive characteristics of each study such as 1) Year of study 2) Author 3) Title 4) Intervention 5) Country 6) Sample 7) Age of infants 8) Frequency 9) Outcome measure 10) Findings 11) Journal 12) Design 13) Score on appraisal tool. All studies were then descriptively coded to identify characteristics of the

interventions and draw conclusions around aspects of the studies that would be useful to consider when considering designing a similar intervention.

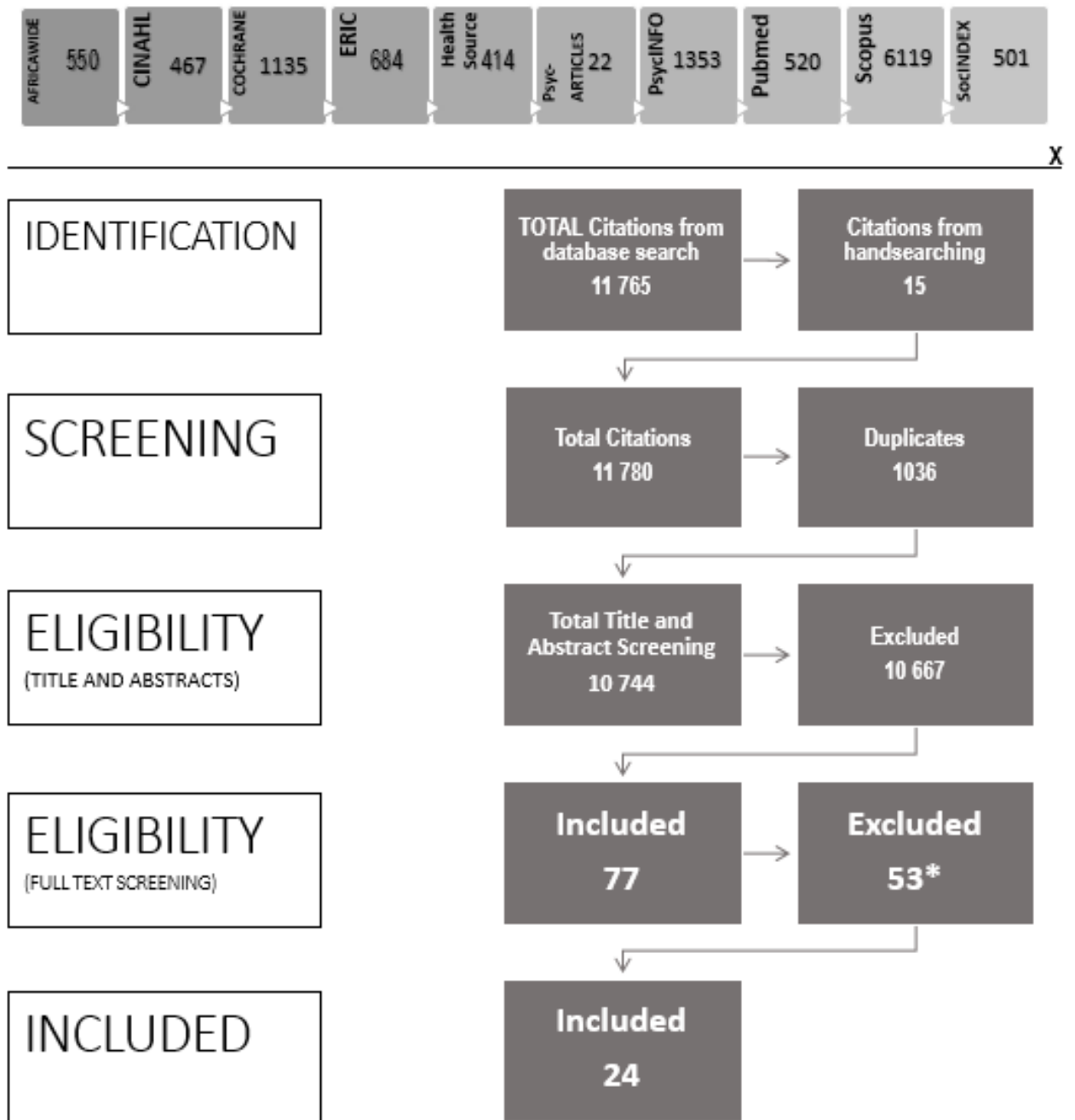
Given the great diversity of designs and outcomes, a quantitative synthesis was not suitable for this review. Furthermore, the aim of the review was to identify interventions and consider the different aspects of intervention delivery that contribute to the outcomes. This aim is better achieved through categorisation and description in a narrative synthesis. The Guidance on the Conduct of Narrative Synthesis in Systematic Reviews (Popay et al., 2006; Rodgers et al., 2006) was loosely drawn on to inform the process of 4 key stages:

1. Developing a theory
2. Basic synthesis through tabulation (refer to Table 3) and textual descriptions (the component descriptions in the results section)
3. Exploring relationships between the studies
4. Assessing the synthesis

Results

A total of 11 780 abstracts from the databases and hand searches were found, of which 1036 were duplicates (See Figure 1 PRISMA diagram (below) for further details). Title and abstract review excluded a further 10 667. Full text of 77 articles were reviewed which excluded a further 53 articles that did not meet the eligibility requirement (Refer to Additional Document 2 for further information on excluded articles). After the screening process there were 24 studies included in the review that are detailed in Table 3. The critical appraisal results are presented in Table 4, 5, 5 & 7.

Figure 1: Prisma Diagram



*Refer to Additional File 2 for all full text articles excluded and the rationale for exclusion.

Table 3: Included Articles

	Year	Author	Title	Intervention	Country	Sample	Frequency	Staff	Age of infants	Relevant Outcome measure	Findings	Journal	Study Design	Appraisal Tool Score
Africa														
1	2002	Peter J Cooper, Mireille Landman, Mark Tomlinson, Christopher Moleno, Leslie Swartz, Lynne Murray	Impact of a mother—infant intervention in an indigent peri-urban South African context: Pilot study	Home visits by CHW	South Africa	32	<ul style="list-style-type: none"> • 2 visits antenatally • Fortnightly for first 4 weeks postnatally • Weekly for a further 8 weeks postnatally • Fortnightly for a further 4 weeks • Monthly for a further 8 weeks 	CHW	Antenatally-20 weeks	• Study's own rating tool	There was a positive impact on mother-infant interactions.	The British Journal of Psychiatry	Quasi-Experimental design	5 / 9
2	2009	Peter J Cooper, Mark Tomlinson, Leslie Swartz, Mireille Landman, Chris Molteno, Alan Stein, Klim McPherson, & Lynne Murray	Improving quality of mother-infant relationship and infant attachment in socioeconomically deprived community in South Africa: randomised controlled trial	Home visits by CHW	South Africa	449	<ul style="list-style-type: none"> • 2 visits antenatally • Weekly for the first eight weeks postpartum • Fortnightly for a further 8 weeks • Monthly for two months 	CHW	Antenatally-20 weeks	<ul style="list-style-type: none"> • “Established measure” of sensitivity (12 months) • Parent/ caregiver involvement scale (6 & 12 months) • Strange situation at 18 months 	At both 6 & 12 months the intervention group had significantly more sensitive interactions with their infants and were less intrusive. Significantly more intervention infants were securely attached at 18 months.	BMJ	RCT	8 / 13
3	2014	Peter J. Cooper, Zahir Vally, Hallam Cooper, Theo Radford , Arthur Sharples, Mark Tomlinson, Lynne Murray	Promoting Mother–Infant Book Sharing and Infant Attention and Language Development in an Impoverished South African Population: A Pilot Study	Group sessions with a 15 minute individual slot within each group	South Africa	30	• Once a week (1.5h) for 7 weeks	CHW	15 and 17 months	Study's own assessment of sensitivity, responsivity, facilitation and reciprocity	Significant increase in sensitivity.	Early Childhood Education Journal	RCT	11 / 13
4	2015	M.M. Van der Walt , H. Coetzee , W. Lubbe and S.J. Moss	Effect of prenatal stimulation programmes for enhancing postnatal bonding in primigravida mothers from the Western Cape	Self administered home programme	South Africa	12	• 3 x p/d (5-10 minutes of stimulation per episode) for a minimum period of four weeks	Self	Third trimester pregnancy to 6 weeks	<ul style="list-style-type: none"> • Prenatal Attachment Inventory • Post-test Maternal Attachment Inventory (MAI) 	The intervention did not significantly increase bonding six weeks post-birth, however, it indicated a moderate effect.	Africa Journal of Nursing and Midwifery	RCT	12 / 13
5	2016	Lynne Murray, Leonardo De Pascalis, Mark Tomlinson, Zahir Vally, Harold Dadomo, Brenda MacLachlan, Charlotte Woodward, Peter J. Cooper	Randomized controlled trial of a book-sharing intervention in a deprived South African community: effects on carer-infant interactions, and their relation to infant cognitive and socio-emotional outcome	Group sessions with a 15 minute individual slot within each group	South Africa	91	• 90-minute group sessions conducted once a week for 8 weeks	CHW	14–16 months	• Study's own rating tool as used in study 1	Significant improvement in interactions (sensitivity, elaborations and reciprocity).	Journal of Child Psychology and Psychiatry	RCT	11 / 13

Table 3: Included Articles

	Year	Author	Title	Intervention	Country	Sample	Frequency	Staff	Age of infants	Relevant Outcome measure	Findings	Journal	Study Design	Appraisal Tool Score	
Asia															
	6	2011	Frances E. Aboud & Sadika Akhter	A Cluster-Randomized Evaluation of a Responsive Stimulation and Feeding Intervention in Bangladesh	Group sessions	Bangladesh	302	<ul style="list-style-type: none"> Group session once a week for 5 weeks Sixth session 4 months later 	Peer educator	8-20 months	<ul style="list-style-type: none"> Home Observation for Measurement of the Environment (HOME) Inventory 	HOME inventory scores were higher in the intervention groups compared with controls. Responsive talk was also significantly higher in the mothers in the intervention group	Pediatrics	RCT	12 / 13
	7	2012	Amy L. Frith, Ruchira T. Naved, Lars Ake Persson, Kathleen M. Rasmussen, and Edward A. Frongillo	Early Participation in a Prenatal Food Supplementation Program Ameliorates the Negative Association of Food Insecurity with Quality of Maternal-Infant Interaction	Micronutrient supplementation	Bangladesh	180	<ul style="list-style-type: none"> Daily nutrient supplementation 	Community Nutrition Educators (local women)	14 weeks gestation-3.4-4.0 mo postpartum	<ul style="list-style-type: none"> Nursing Child Assessment Satellite Training Feeding Scale 	Mothers who were started on earlier food supplementation at 9 weeks gestation demonstrated much more sensitive caregiving at 4 months post delivery	The Journal of Nutrition	RCT	13 / 13
	8	2013	Frances E. Aboud , Daisy R. Singla , Md Imam Nahil , Ivelina Borisova	Effectiveness of a parenting program in Bangladesh to address early childhood health, growth and development	<p>Intervention 1</p> <ul style="list-style-type: none"> Parenting practices group education meetings Parenting/health education illustrative card <p>Intervention 2</p> <ul style="list-style-type: none"> Short home visits Clinic appointments for health/parenting messages 	Bangladesh	463	<p>Intervention 1:</p> 14 sessions (fortnightly for 4 months and monthly for 6 months) <p>Intervention 2:</p> Home visits (range 1-5 visits)	Local women	4 to 14 months (+10 months for programme length)	<ul style="list-style-type: none"> HOME Inventory 	HOME stimulation scores were significantly higher among intervention caregivers than controls	Social Science & Medicine	RCT	12/13
	9	2015	Angela F. Lukowski, Xicheng Liu, Patricio Peirano, Mauricio Odio & Patricia J. Bauer	Disposable Diaper Use Promotes Consolidated Nighttime Sleep and Positive Mother-Infant Interactions in Chinese 6-Month-Olds	<ul style="list-style-type: none"> Night time disposable diaper use 	China	82	<ul style="list-style-type: none"> Nightly for 6 weeks 	Research Agency Worker	6 months old	<ul style="list-style-type: none"> Coding scheme used for NICHD Study of Early Childcare 	Mothers of infants who wore disposable diapers demonstrated more engagement and sensitivity towards their infants.	Journal of Family Psychology	RCT	9/13

Table 3: Included Articles

	Year	Author	Title	Intervention	Country	Sample	Frequency	Staff	Age of infants	Relevant Outcome measure	Findings	Journal	Study Design	Appraisal Tool Score
10	2014	Monire Toosi ; Marzieh Akbarzadeh ; Farkhondeh Sharif ; Najaf Zare	The Reduction of Anxiety and Improved Maternal Attachment to Fetuses and Neonates by Relaxation Training in Primigravida Women	<ul style="list-style-type: none"> • 4 Antenatal education sessions including relaxation training • A relaxation CD & Manual 	Iran	84	<ul style="list-style-type: none"> • 4 Education sessions of 90 minutes weekly for 4 weeks • At home daily relaxation using a CD to be used daily before the delivery 	Researcher	32-35 weeks gestation and then on the first day post delivery	• Mother- infant attachment checklist	Significant difference in attachment	Women's Health Bulletin	RCT	7/13
11	2014	Aisha K. Yousafzai, Muneera A. Rasheed, Arjumand Rizvi, Robert Armstrong, Zulfiqar A. Bhutta	Parenting Skills and Emotional Availability: An RCT	<p>Intervention 1: Home visits and group meetings focused on responsive caregiving</p> <p>Intervention 2: Micronutrient Powder and Home visits focused on nutrition</p> <p>Intervention 3: Both</p>	Pakistan	1489	<p>2-year duration of Intervention 1</p> <p>Monthly group meetings & home visits</p> <p>Intervention 2: Monthly home visits</p> <p>Intervention 3: Both</p>	Lady health workers	Birth-24 months	• Observation of Mother and Child Interaction (OMCI) tool	Mother-child dyads exposed to RS compared with no RS had significantly higher mean scores at 12 months vs mean and 24 months of age	Pediatrics	RCT	12/13
12	2006	Ilgı Ozturk Ertem, Gulsum Atay, Bahar Emine Bingoler, Derya Gumus Dogan, Asuman Bayhan & Dolunay Sarica	Promoting child development at sick-child visits: A controlled trial	<ul style="list-style-type: none"> • Responsivity focused coaching at sick child paediatrician visits 	Turkey	233	2 appointments a week apart	Doctors	0- 24 months	• HOME Inventory	No significant differences in score of HOME between intervention and control.	Pediatrics	Quasi-Experimental design	7/9
13	2014	Ilgun Ozen Cinar & Ahmet Ozturk	The Effect of Planned Baby Care Education Given to Primiparous Mothers on Maternal Attachment and Self-Confidence Levels	<ul style="list-style-type: none"> • Home visits & Education booklet 	Turkey	81	One off 90 minute visit	Researchers	30-59 days at the beginning of the study+8 weeks for post testing	• Maternal Attachment Inventory	Significant positive effects on infant attachment	Health Care for Women International	Quasi-Experimental design	9/9
14	2015	Pınar Serçekuş, & Hatice Başkale	Effects of antenatal education on fear of childbirth, maternal self-efficacy and parental attachment	<ul style="list-style-type: none"> • Group sessions 	Turkey	63	Once a week group session (120 minutes) for 8 weeks	Unknown	Third trimester pregnancy	Maternal Attachment Inventory (MAI) and the Postnatal Paternal-Infant Attachment Questionnaire (PPAQ). Questionnaires administered when infants were 4 months old for maternal attachment and 6 months old for paternal attachment	This study found that antenatal education has no influence on post partum maternal and paternal attachment.	Midwifery	Quasi-Experimental design	8/9

Table 3: Included Articles

	Year	Author	Title	Intervention	Country	Sample	Frequency	Staff	Age of infants	Relevant Outcome measure	Findings	Journal	Study Design	Appraisal Tool Score	
	15	2016	Ayşegül Ulutaş Ayşe Belgin Aksoy	The Effect of the Home-Centered Mother-Infant Interaction Program on Infant Development Through Mutual Interaction And Mothers' Intuitive Behaviors	Home visits	Turkey	44	3 months of weekly 45 minute sessions at home (total: 12 sessions)	Researcher	9-12 months	• Temperament Assessment Battery: Sensitivity and Synchrony Subtests	Significant increase intuition and mutuality but this was not maintained at 3 weeks post intervention	Education and Science	Quasi-Experimental design	7/9
	16	2016	Rempel, Lynn A., Rempel, John K. Khuc, Toan Nang Vui, Le Thi	Influence of Father-Infant Relationship on Infant Development: A Father-Involvement Intervention in Vietnam	<ul style="list-style-type: none"> • Group intervention /Fathers Club • Home Visits • Coaching at birth • Poster information • Interaction calendar • Weekly broadcast • Fathers competition 	Vietnam	733	<ul style="list-style-type: none"> • 3rd trimester: group session & follow up visit • At birth coaching by midwives & provision of interaction calendar • Home visits at 7 days, 6 weeks and 15 weeks post-delivery • Health promotion posters throughout • 10-minute broadcasts weekly • Fathers club monthly for 6 months 	Health worker	Antenatal-9 months	<ul style="list-style-type: none"> • Self-report Father-Infant Interaction Scale • Self-report Paternal-infant Attachment Scale 	At all intervals intervention men were more emotionally attached to their infants, even more to female infants as reported by fathers.	Developmental Psychology	Quasi-Experimental design	8/9
Europe															
	17	2009	L. Kalinauskienė, D. Cekuoliene, M. H. Van IJzendoorn, M. J. Bakermans-Kranenburg, F. Juffer and I. Kusakovskaja	Supporting insensitive mothers: the Vilnius randomized control trial of video-feedback intervention to promote maternal sensitivity and infant attachment security	• Home Visits	Lithuania	54	1 session per month for 5 month	Psychologists	7 -12 months	<ul style="list-style-type: none"> • Ainsworth's Sensitivity Scale • Attachment Q 	Changes in sensitivity and not attachment	Child: Care, Health and Development	RCT	10/13
	18	2009	Lee MacKinnon	Evaluation of a Parenting Skills Program in Russia	• Group sessions	Russia	15	10 week group session of 90 minutes per group	Programme coordinator	Only described as "babies"	Semi-structured, in-depth interviews with mothers and a photovoice project	maternal behaviors shifted to include more sensitive, responsive parenting behavior	Applied Research and Evaluation	Qualitative Study	7/10

Table 3: Included Articles

	Year	Author	Title	Intervention	Country	Sample	Frequency	Staff	Age of infants	Relevant Outcome measure	Findings	Journal	Study Design	Appraisal Tool Score
South America														
19	1999	Wendland-Carro, Jacqueline Piccinini, Cesar A. Millar, W. Stuart	The Role of an Early Intervention on Enhancing the Quality of Mother-Infant Interaction	<ul style="list-style-type: none"> • Video and one on one coaching at the video session • Written information 	Brazil	38	One session	The investigator	2-3 day old infants-1 month	• Unnamed coding system from a historical study	Reliable increase in sensitive responses, not significant	Child Development	RCT	10/13
20	2010	M. P. Santelices M. Guzmán G, M. Aracena, C. Farkas, I. Armijo, C. P. Pérez-Salas and A. Borghini	Promoting secure attachment: evaluation of the effectiveness of an early intervention pilot programme with mother–infant dyads in Santiago, Chile	<ul style="list-style-type: none"> • Group sessions • Individual sessions 	Chile	100	<ul style="list-style-type: none"> • 6 group workshops of 2 hours each • 4 Individual sessions of 1 hour each (Baby age: 1,3, 6 &12mths) 	Researcher	Pregnancy and then 1, 3,6 &12 month olds	• Strange situation	More babies with secure attachment in the experimental group, but this was not significant	Child: care, health and development	RCT	7/13
21	2012	Figueroa Leigh, Binda Vergara & Pía Santelices	Enhancing early attachment: Design and pilot study of an intervention for primary health care dyads	<ul style="list-style-type: none"> • Group workshop 	Chile	11	Four group workshops of two hours each, held weekly for 4 weeks	Professional health care workers	6-12 months	• Massie Campbell Scales	Improved quality of attachment but not statistically significant	Journal of Child Health Care	Quasi-Experimental design	3/9
22	2015	Rodrigo A. Cárcamo,a, b, Harriet J. Vermeerb, René van der Veerb and Marinus H. van Ijzendoorn	Early Full-Time Day Care, Mother–Child Attachment, and Quality of the Home Environment in Chile: Preliminary Findings	<ul style="list-style-type: none"> • Public day care 	Chile	110	Full time (up to 40 hours per week)	Caregiver	Mean age 6.4 months	• IT-HOME	Positive changes in attachment security	Early Education and Development	Cohort Study	6/11
23	2016	Paulina Brahma, Alejandra Cortázarb, María Paz Fillolc, María Verónica Mingoc,d, Constanza Vielmae and María Consuelo Aránguiz	Maternal sensitivity and mental health: does an early childhood intervention programme have an impact?	<ul style="list-style-type: none"> • Group sessions • Home visits • Individual sessions at the Health Centre 	Chile	102	Weekly groups which can be attended for as long as the mother wants or until the child turns 4	GPs, psychologists and teachers	2-23 months	• Q-sort Maternal Sensitivity	Improved maternal sensitivity in older children	Family practice	Quasi-Experimental design	6/9
24	2017	María Pía Santelices, Chamarrita Farkas, Marcela Aracena	Evaluation of the effectiveness of a pilot program that promotes sensitive response in the educational staff of Chilean nursery schools	<ul style="list-style-type: none"> • Workshops • Field supervision 	Chile	53	Monthly for 4 hours (alternating workshop and supervision) for 12 months= Total 12 sessions	Psychologists or psychology students	3-24 months	• CAREIndex	Significant change in sensitivity	Children and Youth Services Review	Quasi-Experimental design	7/9

Table 4 RCT Critical Appraisal

RCT Design Methodological Quality Criteria	2. Cooper et al (2008)	3. Cooper et al (2013)	4. Van der Walt (2016)	5. Murray et al (2016)	6. Aboud & Akhter (2011)	7. Frith et al (2012)	8. Aboud et al (2013)	9. Lukowski et al (2015)	10. Toosi et al (2014)	11. Yousafzai et al (2015)	17. Kalinausk iene et al (2009)	19. Wendlan d-Carro et al (1999)	20. Santelice s et al (2010)
Was true randomization used for assignment of participants to treatment groups?	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	Unclear
Was allocation to treatment groups concealed?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Unclear
Were treatment groups similar at the baseline?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Were participants blind to treatment assignment?	Unclear	Yes	Yes	Unclear	Yes	Yes	Yes	No	Unclear	Yes	Unclear	Yes	Yes
Were those delivering treatment blind to treatment assignment?	Unclear	No	Yes	Unclear	No	Yes	Yes	No	No	Unclear	No	No	No
Were outcomes assessors blind to treatment assignment?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Unclear
Were treatment groups treated identically other than the intervention of interest?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	No	Yes	Unclear	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No
Were participants analyzed in the groups to which they were randomized?	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were outcomes measured in the same way for treatment groups?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes
Were outcomes measured in a reliable way?	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Was the trial design appropriate?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total	8/13	11/13	12/13	11/13	12/13	13/13	12/13	9/13	7/13	12/13	10/13	11/13	6/13

Table 5 Quasi-Experimental Design Critical Appraisal

Quasi Experimental Design Methodological Quality Criteria	1. Cooper et al (2002)	12. Ertem et al (2006)	13. Ozen Cinar et al (2014)	14. Sercekus et al (2016)	15. Ulutas &Aksoy (2016)	16. Rempel et al (2017)	21. Figueroa Leigh (2012)	23. Brahma et al (2016)	24 Santelices (2017)
Is it clear in the study what is the 'cause' and what is the 'effect'	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Were the participants included in any comparisons similar?	Unclear	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Unclear	Yes	Yes	Yes	Yes	Yes	N/A	Unclear	Unclear
Was there a control group?	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Were there multiple measurements of the outcome both pre and post the intervention/exposure?	No	No	Yes	No	Yes	Yes	No	No	Yes
Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	No	No	Yes	Yes	Unclear	No	Yes	N/A	Yes
Were the outcomes of participants included in any comparisons measured in the same way?	Yes	Yes	Yes	Yes	Yes	Yes	N/A	Yes	Yes
Were outcomes measured in a reliable way?	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear
Was appropriate statistical analysis used?	Yes	Yes	Unclear	Yes	Yes	Yes	Unclear	Yes	Yes
Total	5/9	7/9	8/9	8/9	7/9	8/9	3/9	6/9	7/9

Table 6 Qualitative Design critical appraisal & Table 7 Cohort Study critical appraisal

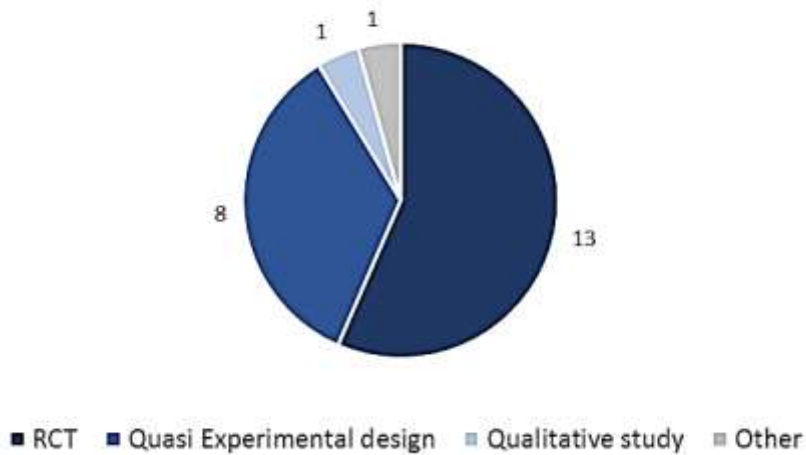
Qualitative Design Methodological Quality Criteria	18. MacKinnon (2014)
Is there congruity between the stated philosophical perspective and the research methodology?	N/A
Is there congruity between the research methodology and the research question or objectives?	Yes
Is there congruity between the research methodology and the methods used to collect data?	Yes
Is there congruity between the research methodology and the representation and analysis of data?	Yes
Is there congruity between the research methodology and the interpretation of results?	Yes
Is there a statement locating the researcher culturally or theoretically?	No
Is the influence of the researcher on the research, and vice-versa, addressed?	No
Are participants, and their voices, adequately represented?	Yes
Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	Yes
Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	Yes
Total	7/10

Cohort Study Methodological Quality Criteria	22. Cárcamo et al (2015)
Were the two groups similar and recruited from the same population?	Yes
Were the exposures measured similarly to assign people to both exposed and unexposed groups?	No
Was the exposure measured in a valid and reliable way?	No
Were confounding factors identified?	Yes
Were strategies to deal with confounding factors stated?	Yes
Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?	No
Were the outcomes measured in a valid and reliable way?	Yes
Was the follow up time reported and sufficient to be long enough for outcomes to occur?	Yes
Was follow up complete, and if not, were the reasons to loss to follow up described and explored?	No
Were strategies to address incomplete follow up utilized?	Yes
Was appropriate statistical analysis used?	No
Total	6/11

Study designs

As the review sought to examine interventions, many of the included studies were experimental in design. A large proportion of studies were randomised control trials (Total: 13) [2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 17,19 &20] and quasi-experimental designs (Total:9) [8, 12, 13, 14, 15, 16, 21, 23 &24] with only a single qualitative study [18] and cohort study [22].

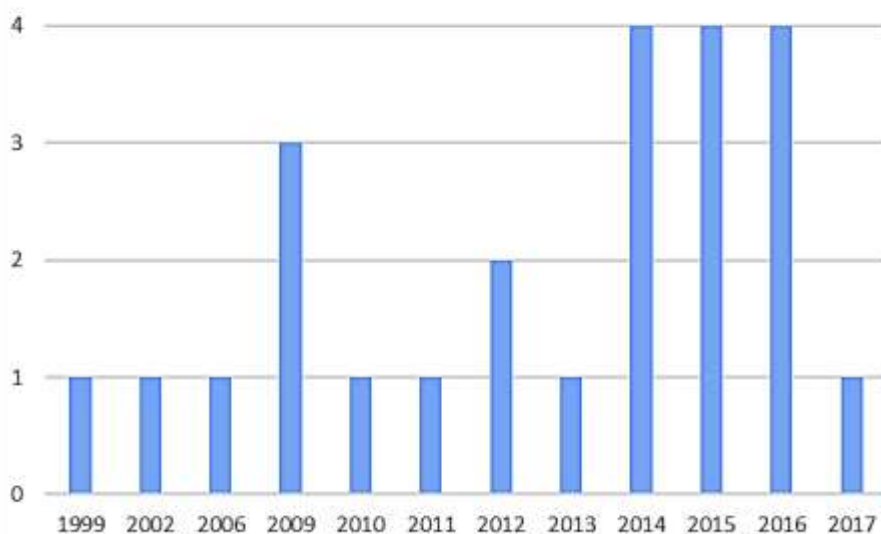
Figure 2: Study Designs



Year of publication

Despite having a very broad date range in the search, all the included articles that met the criteria were all published between 1999-2017. Figure 3 demonstrates the distribution of studies by year of publication and does appear to reflect the momentum in the broader area of child development which has seen a significant increase in policy, funding and research (Daelmans et al., 2017).

Figure 3: Year of Publication

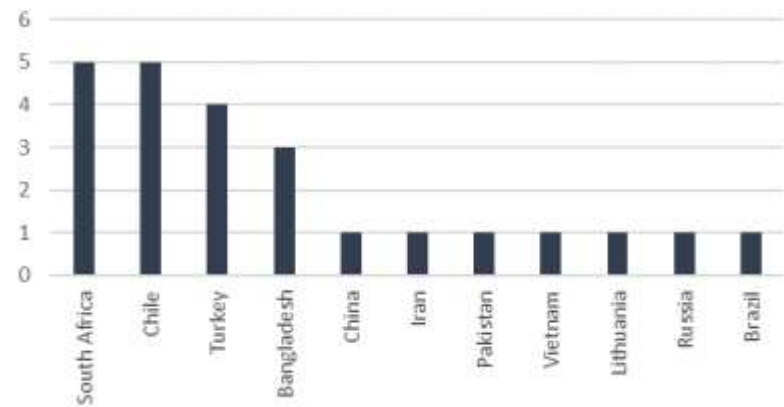


Location of studies

There was a broad range of countries where the studies took place, although there was some clustering in Chile (total:5) [20,21,22,23,24] South Africa (Total: 5) [1,2,3,4,5], Turkey (Total: 4) [12,13,14,15] and Bangladesh (Total: 3) [6,7,8].

This is reflected in Figure 4.

Figure 4: Countries where studies were undertaken



Participant characteristics

Although the studies were all derived from LMICs there was considerable variation in the population studied from food insecure rural women (Frith et al., 2015) to women aged 20-34 accessing private antenatal care with at least secondary education (van der Walt et al., 2016). Most of the studies were undertaken with mothers rather than other caregivers, and some of the studies had samples that would not be representative of their country's population. For example, in one Turkish study 83.9% of the participants were university educated (Serçekuş and Başkale, 2016). Given that maternal/parental education has a considerable effect on development (Black et al., 2017) this highly educated sample is likely to distort the results.

Infant Age at Intervention

The age at commencement of intervention varied considerably from starting in pregnancy [1,2,4,7,10,14,16,20] to beginning at 15 months [3]. The spread of age at initiation, with no obvious association between outcomes and age of the infant makes it unclear whether there is an optimum age for intervention. This was also the finding of one of the studies that conducted analysis by age and found improvements at all ages (Aboud et al., 2013a).

Intervention characteristics

Home Visiting Interventions

Home visiting was an effective method of delivering interventions with five studies focused exclusively on home visits. All had positive effects on sensitivity and/or attachment, two of which showed significant effects. A quasi-experimental pilot study of 32 participants (Cooper et al., 2002) was undertaken in a peri-urban setting in South Africa where women were visited from the antenatal period up to 20 weeks post-partum by Community Health Workers (CHW) utilizing an adapted approach of a health visiting intervention from the UK. The intervention group showed greater sensitivity towards their infants. The RCT that followed in 2009 (Cooper et al., 2009b) had a much bigger sample of 449 women. In this study, in addition to measuring the quality of interaction the authors also measured attachment. The intervention mothers were shown to be significantly more sensitive and less intrusive towards their infants. The study utilized the gold standard of attachment assessment with the use of the Strange Situation Procedure when the infants were 18 months old, which showed that a significantly larger number of the infants in the experimental group were securely attached. This is a significant result as few studies, even in high resource settings can effect changes in attachment.

A quasi-experimental study was conducted in Turkey (Çinar and Öztürk, 2014) where researchers delivered education in the family's home over an 8-week period. The study used the Maternal Attachment Inventory to assess for changes in attachment and found a statistically significant difference after the intervention in the intervention, but not the control group. Another Turkish study with a sample of 44 dyads (Ulutas and Kanak, 2016) also had 12 home education sessions that involved modelling of behavior by the researcher. Although the results were initially promising and significant in terms of mutual interaction, the positive effects decreased significantly when re-assessed 3 weeks after the intervention.

In Lithuania an RCT was undertaken examining the effect of five monthly home visits. This intervention used video recordings of the mother-infant interactions to provide feedback for the next session. Maternal sensitivity was significantly increased, however attachment levels remained unchanged.

The success of home intervention programmes may be that having interventions at home are accessible as there are no practical considerations like transport. It may also be that interventions can be specifically tailored to individual needs making interventions more meaningful to the participant.

Group Interventions

Six of the included studies offered group intervention. A study in Iran delivered four 90-minute relaxation sessions over a month to women who were pregnant for the first time (Toosi et al., 2014). The attachment between mother and baby were then assessed postpartum and the results showed a significant difference between groups. In another quasi-experimental study in Turkey that used group antenatal education with some focus on caregiver-child interaction, the sessions were 120-minutes over eight weeks to both fathers and mothers but results showed no significant differences in attachment.

There were two Bangladeshi studies of high quality: one programme was delivered by CHW through 6 sessions over 6 months (Aboud and Akhter, 2011) and the other study with 14 sessions (Aboud et al., 2013b). Even though the interventions were delivered in a group setting there was individualized coaching which was mentioned as key for enabling learning in a poorly educated population. The 14-session intervention had significant results where the 6-session intervention showed positive change with significant results in just one part of the assessment. With only two studies it would not be possible to say conclusively but the different results do suggest that a longer intervention results in a stronger outcome.

The only qualitative study in the review was a group intervention over 10 weeks that was successful in improving maternal sensitivity and responsivity (MacKinnon, 2013). The study found that being part of the group was a key, allowing the women to share, reflect and develop social resources. The programme was also not heavily structured and the subsequent week's content would be determined by group discussions. The final group intervention was piloted on a small sample in Chile that included four sessions of 120 minutes (Figuerola Leigh et al., 2013). This intervention resulted in more than half of the group having an altered state of attachment, but this was not maintained when the group was followed up 4 months later.

It seems that group interventions show similar efficacy to home visiting (individual interventions) and may be easier to implement from a resource perspective. Coaching was identified as important so caregivers could work directly with their child applying the knowledge they had learnt. The number of sessions also seemed to have an impact in some studies, but not others.

Combined Interventions

The largest proportion of included studies reported on interventions that used a combined approach (group and individual intervention). In an RCT pilot study in peri-urban South Africa (Cooper et al., 2014) of 30 carers partook in a book sharing project where they had a group session followed by an individual 15 minute slot where learning could be applied. It was found that the caregivers in the study became more sensitive to their infants. The full trial of this study (Murray et al., 2016) with 42 participants had similarly positive results.

A large RCT in Bangladesh (Aboud et al., 2013b) combined a range of interventions (group, home visits & clinic visits) which resulted in significant improvements in responsiveness and other parenting outcomes, as did an RCT in Pakistan (Yousafzai et al., 2015) which showed large effect sizes for caregiver-infant interaction.

A Vietnamese study of 772 participants that focused on responsive caregiving in fathers used a number of modalities including group intervention, public messages, individual coaching and a fathering competition (Rempel et al., 2017). This multi-pronged approach had positive results at all measurement points. They also were significantly more responsive when assessed at 1-month post birth but not the 4 & 9-month points. Although the results were positive, the considerable intensity and effort of the intervention was not reflected in the results

A Chilean study combined group and individual sessions where the interaction between the caregiver and infant was observed and commented on by the researcher (Santelices et al., 2011). This bespoke approach resulted in a larger proportion of the experimental group having a secure attachment, although this was non-significant. Similar outcomes were achieved with combined group and individual sessions depending on need and delivered by highly qualified professionals (Brahm et al., 2015). The intervention influenced

maternal sensitivity in dyads where the infant was over 12 months, but not younger. Given the costs of professional staff non-significant results are disappointing.

Combined interventions are more onerous and this is only partially reflected in the results. The three combined interventions that yielded significant results [3, 5, 11] were all delivered by lay workers where the professional interventions had mediocre results with one study showing no difference. This is a promising finding given the shortage of professional staff that exists in many LMIC settings.

Self-administered interventions

There was a single study in South Africa (van der Walt et al., 2016) with 17 participants that was a self-administered intervention of specific stimulation activities at specific ages of the fetus with an assessment of attachment at 6 weeks. The intervention had a moderate effect, and this was with middle class women with secondary education. It is likely that in a more typical LMIC population where education levels are lower that self-administered interventions are even less likely to be successful.

Practical interventions

Two of the studies explore practical interventions. One high quality RCT with a cohort of 180 mother-infant dyads explored whether commencing maternal food supplementation at 9 weeks gestation had a positive effect on interaction. The study showed that dyads commenced on earlier food supplementation had similar quality interactions as food secure dyads, whilst the control group mothers had the lowest interaction scores. The study also suggested that part of the benefit could have been derived not from nutrition alone, but from the fact that they had a lot more social interaction and support through accessing the programme. It is surprising how few of the studies incorporated material needs into the intervention given how considerable material needs can be in LMIC.

The other practical intervention was a RCT of night-time use of disposable nappies in China where they are not commonly used. In this study they rated both the infant's interactions and the caregiver's responses. At baseline interactions in both groups were similar but post intervention the intervention group mothers were

more sensitive and engaged with a medium effect size. The change is attributed to differences in sleep between the groups that was also monitored in the study through actigraphy and self-report. This study was sponsored by a nappy company and disposable nappies are unlikely to be an intervention that would be financially realistic in most LMICs.

Dose of Intervention

The frequency of the interventions ranged from a once off intervention (Wendland-Carro et al., 1999a) to full time for one year (Cárcamo et al., 2016b). The single session intervention was undertaken in a hospital in Brazil. Here 36 women were seen 2-3 days post-delivery and shown a video on infant interaction, followed by an interactive discussion with the facilitator. Participants were also given written materials to take home. Despite such a short intervention (1 session) there was an increase in synchronous responses in the intervention group. A similarly short intervention was tested in Turkey at 233 well child visits (Ertem et al., 2006) where pediatricians were given advanced training and were required to coach parents in responsivity at paediatrician appointments. This had no effect on caregiver responsivity a week later.

At the other end of the spectrum is a Chilean cohort study (Cárcamo et al., 2016a) of 95 infants from poor families under 12 months old in full time day-care which found no changes in attachment for most children and improvements in attachment for infants from a particularly disadvantaged ethnic group. In a similar scheme in Chile a study aimed to improve the sensitivity of the staff working with the infants (Santelices et al., 2017) and saw significant improvements in sensitivity. The other studies had varied intensity. It is difficult to say conclusively that there is a relationship between dose and outcome as there were outcomes of short duration that were successful, however the outcomes measured were not the same between studies. For example in the Brazilian study (Wendland-Carro et al., 1999b) they were assessing sensitivity in 2-3 day old neonates which is a very different outcome to assessing attachment classifications which is developed through significant amounts of interaction in the South African study (Cooper et al., 2009a). What is clear is that in most of the studies that yielded significant results the intervention spanned a number of months. Given the

resource constraints of LMICs it is important that an optimum dose is established so that services can be delivered in the most cost-effective manner.

Outcome Measures

There was an array of outcome measures [15] that were used in the studies to measure responsiveness and attachment. The most used tool was the Home Observation for Measurement of the Environment (HOME) which was used in four studies [6,8, 12 &22]. This reliable and valid tool aims to measure stimulation and support in the child's environment, and has a sub-scale of responsiveness. Three studies [1, 3 &5] used tools they had devised themselves. The Maternal Attachment Inventory(MAI) was used three times [4,13,14] and the Strange Situation was used twice [2,20]. Although the MAI purports to be measuring attachment it was used with very young babies where you would not be able to see attachment as it is understood in the theoretical construct of Bowlby or Ainsworth. It was helpful that most studies used reliable and valid tools. Each of these tools measures slightly different things so one cannot directly compare study results.

Health workers delivering the intervention

The staff delivering the interventions ranged from local individuals who had not completed their secondary education in 8 of the studies [1,2,3,5,6,7,8,11] to high level professionals such as doctors and psychologists [12,17,21,23,24], as well as the researchers themselves [9,10, 13,15,19,20].

Discussion

The aim of this systematic review was to describe and critically assess interventions that seek to effect change on caregiver responsiveness and attachment. This included examining the effect interventions had. Despite previous reviews suggesting there were extremely limited number of studies in LMICS settings (Eshel et al., 2006a), the review identified 24 studies in LMICS settings, most of which (22/24) had a positive effect on responsiveness or attachment. Almost half of the studies (10/24) had significant effects that suggest that interventions to support responsiveness and attachment would add value to current maternal and child health care

provision in LMICS settings. The findings from the review were similar to comparable reviews in higher income settings (Eshel et al., 2006a; Britto, 2015; Bakermans-Kranenburg et al., 2003) but differs in some conclusions such as the effect of dose on efficacy (Bakermans-Kranenburg et al., 2003) and the effectiveness of unqualified staff (Britto et al., 2015). Perhaps having a more extensive intervention is more valuable in a LMIC setting where education levels are lower and key messages may require further reinforcement.

Importantly the review demonstrated that there can be positive effects, and even significant positive effects of interventions delivered by CHW with limited formal education. In some instances, the results were stronger than studies with professional staff. This could be due to more availability of the staff, or the fact participants were able to relate more to staff of a similar level of education and background and warrants further investigation. What this finding does mean is that being able to implement these interventions is more feasible as it does not require professional staff who are in short supply and too expensive in most LMIC settings.

This review shows that there is good evidence for interventions delivered in participant's homes but that these interventions need to be delivered with a certain level of intensity and over an extended period to be efficacious. It was interesting to note that the home visiting interventions with CHW [1,2,8] had a more significant effect than some of those delivered by professionals [17]. In fact, the only two interventions in the review that showed no effect were both delivered by professionals [12, 14]. This could perhaps be due to the caregivers being able to relate more to the workers from their community and vice versa. This could also be because the number of sessions with a CHW tends to be greater than a professional, and the additional contact time has an effect allowing messages to be reinforced.

There was also good evidence for group interventions (7 studies). Again, more of the studies delivered by CHW [3/3] had significant effects than those delivered by professionals [1/4] but the group interventions also needed many sessions delivered over an extended period (two or months or more) to be beneficial. The positive findings from the group and individual interventions came through also in the combined interventions (group and individual intervention). These interventions were similarly successful but did not demonstrate added value for using more than one approach. The number of approaches did not seem to influence the

outcome. One study [16] used six different modalities of delivery but only showed moderate effects. There was no obvious benefit of group over home visiting as both were successful.

Strengths and Limitations

The review included a larger than expected number of studies from a variety of LMIC settings and demonstrates that it is possible to effect changes in responsivity and attachment in LMICs. The studies were all undertaken with children aged under 24 months (unlike previous reviews which had very broad age ranges) which demonstrates the efficacy of very early intervention. The findings of this review are like those conducted in high-income settings that show positive changes in caregiver-infant relationship following intervention (Britto et al., 2015; Eshel et al., 2006a; Bakermans-Kranenburg et al., 2003). Whilst there was variation in the quality of studies, there was a significant number of good quality experimental studies that showed efficacy of interventions that reliably show positive effects.

Although there was heterogeneity in the study designs of included studies, there was sufficient similarity to enable comparison of intensity, mode of delivery and required staff qualifications. The search terms were deliberately broad to ensure that all types of interventions would be included and there would be no bias towards psychological interventions. Consequently, some unexpected interventions were included such as use of disposable nappies and supplementary nutrition, which both demonstrated increases in sensitivity.

There are several limitations of the study the most significant of which is the predominant use of a single reviewer. The risk was partially mitigated by utilising the second author to review 10% of included and 10% of full text exclusions. Due to the risk of selection bias with a single reviewer no studies were excluded on the grounds of quality, instead the scores and critical appraisals have been tabulated and included. The inclusion and exclusion criteria were also very clear, thus reducing the risk of any ambiguity or potential for bias. The search terms were deliberately broad and did not name any interventions to avoid bias.

The study also risks publication bias through exclusion of grey literature. This was excluded due to time constraints, but risks the exclusion of studies that have negative outcomes which are less likely to be published.

A further source of bias is the inclusion of only studies in the English language. The review did contain studies

undertaken in a wide range of non-English countries but it is likely some studies in other languages would have met the other inclusion criteria.

Conclusions

The current review demonstrates that there are multiple interventions which can be delivered in different LMICs that will have a positive effect on sensitivity and attachment. The review gives some indication of delivery modalities that effect change. However, it is not possible from the literature to identify specific factors that influenced outcomes. Qualitative research is needed to gain a better understanding of why these interventions work and why one intervention works better than another.

Only three of the included studies examined whether the effect of the intervention was sustained over time (3 weeks [15], 4 months [21] at 18 months [2]). Given that these interventions are aiming at individual level behaviour changes it cannot be assumed that these changes are sustained over time. It will support the motivation for implementing these interventions into policy and practice if it can be evidenced that changes are maintained in the longer term. Finally, future research should include economic evaluations of these interventions to assess which interventions are more cost effective as this will be an essential consideration if interventions are to be scaled up in low resource settings.

This systematic review has shown that it is possible to make positive changes, and even significant changes to responsive caregiving and attachment across LMICs. These interventions can also be successfully delivered by non-professional staff. These encouraging findings make a compelling case for the implementation of interventions to support responsiveness and attachment in the standard package of care for child health in LMICs.

Additional file 1: Search Terms **Additional file 2:** Excluded full text reviewed characteristics.

Abbreviations:

LMICS: Low and Middle-Income Countries

CHW: Community Health Workers

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Part D: Supplementary Material (as referenced in journal article)

Additional File 1: Search Terms

NB All searches, as detailed in the protocol, were limited to journal articles in English.

Pubmed (17.9.17)

(((((("attachment" OR "sensitiv*" OR "relationship" OR "nurtur" OR "adult-child" OR "behavio" OR "Parent-child" OR Interaction OR Respons* OR "maternal attachment" OR "maternal sensitivity" OR "mother-infant interaction" OR "emotional availability")))) AND ((*therapy OR "parenting program*" OR education OR training OR intervention))) AND (((infant OR infanc* OR dyad OR "mother-infant" OR "mother-baby" OR "caregiver-child")))) AND (((Macedonia[tiab] OR Madagascar[tiab] OR Malagasy Republic[tiab] OR Malaysia[tiab] OR Malaya[tiab] OR Malay[tiab] OR Sabah[tiab] OR Sarawak[tiab] OR Malawi[tiab] OR Nyasaland[tiab] OR Mali[tiab] OR Malta[tiab] OR Marshall Islands[tiab] OR Mauritania[tiab] OR Mauritius[tiab] OR Agalega Islands[tiab] OR Mexico[tiab] OR Micronesia[tiab] OR Middle East[tiab] OR Moldova[tiab] OR Moldovia[tiab] OR Moldovian[tiab] OR Mongolia[tiab] OR Montenegro[tiab] OR Morocco[tiab] OR Ifni[tiab] OR Mozambique[tiab] OR Myanmar[tiab] OR Myanma[tiab] OR Burma[tiab] OR Namibia[tiab] OR Nepal[tiab] OR Netherlands Antilles[tiab] OR New Caledonia[tiab] OR Nicaragua[tiab] OR Niger[tiab] OR Nigeria[tiab] OR Northern Mariana Islands[tiab] OR Oman[tiab] OR Muscat[tiab] OR Pakistan[tiab] OR Palau[tiab] OR Palestine[tiab] OR Panama[tiab] OR Paraguay[tiab] OR Peru[tiab] OR Philippines[tiab] OR Philipines[tiab] OR Phillipines[tiab] OR Phillippines[tiab] OR Poland[tiab] OR Portugal[tiab] OR Puerto Rico[tiab] OR Romania[tiab] OR Rumania[tiab] OR Roumania[tiab] OR Russia[tiab] OR Russian[tiab] OR Rwanda[tiab] OR Ruanda[tiab] OR Saint Kitts[tiab] OR St Kitts[tiab] OR Nevis[tiab] OR Saint Lucia[tiab] OR St Lucia[tiab] OR Saint Vincent[tiab] OR St Vincent[tiab] OR Grenadines[tiab] OR Samoa[tiab] OR Samoan Islands[tiab] OR Navigator Island[tiab] OR Navigator Islands[tiab] OR Sao Tome[tiab] OR Saudi Arabia[tiab] OR Senegal[tiab] OR Serbia[tiab] OR Montenegro[tiab] OR Seychelles[tiab] OR Sierra Leone[tiab] OR Slovenia[tiab] OR Sri Lanka[tiab] OR Ceylon[tiab] OR Solomon Islands[tiab] OR Somalia[tiab] OR Sudan[tiab] OR Suriname[tiab] OR Surinam[tiab] OR Swaziland[tiab] OR Syria[tiab] OR Tajikistan[tiab] OR Tadjikistan[tiab] OR Tadjikistan[tiab] OR Tadjhik[tiab] OR Tanzania[tiab] OR Thailand[tiab] OR Togo[tiab] OR Togolese Republic[tiab] OR Tonga[tiab] OR Trinidad[tiab] OR Tobago[tiab] OR Tunisia[tiab] OR Turkey[tiab] OR Turkmenistan[tiab] OR Turkmen[tiab] OR Uganda[tiab] OR Ukraine[tiab] OR Uruguay[tiab] OR USSR[tiab] OR Soviet Union[tiab] OR Union of Soviet Socialist Republics[tiab] OR Uzbekistan[tiab] OR Uzbek OR Vanuatu[tiab] OR New Hebrides[tiab] OR Venezuela[tiab] OR Vietnam[tiab] OR Viet Nam[tiab] OR West Bank[tiab] OR Yemen[tiab] OR Yugoslavia[tiab] OR Zambia[tiab] OR Zimbabwe[tiab] OR Rhodesia[tiab])) OR (Africa[tiab] OR Asia[tiab] OR Caribbean[tiab] OR West Indies[tiab] OR South America[tiab] OR Latin America[tiab] OR Central America[tiab] OR Afghanistan[tiab] OR Albania[tiab] OR Algeria[tiab] OR Angola[tiab] OR Antigua[tiab] OR Barbuda[tiab] OR Argentina[tiab] OR Armenia[tiab] OR Armenian[tiab] OR Aruba[tiab] OR Azerbaijan[tiab] OR Bahrain[tiab] OR Bangladesh[tiab] OR Barbados[tiab] OR Benin[tiab] OR Byelarus[tiab] OR Byelorussian[tiab] OR Belarus[tiab] OR Belorussian[tiab] OR Belorussia[tiab] OR Belize[tiab] OR Bhutan[tiab] OR Bolivia[tiab] OR Bosnia[tiab] OR Herzegovina[tiab] OR Hercegovina[tiab] OR Botswana[tiab] OR Brasil[tiab] OR Brazil[tiab] OR Bulgaria[tiab] OR Burkina Faso[tiab] OR Burkina Fasso[tiab] OR Upper Volta[tiab] OR Burundi[tiab] OR Urundi[tiab] OR Cambodia[tiab] OR Khmer Republic[tiab] OR Kampuchea[tiab] OR Cameroon[tiab] OR Cameroons[tiab] OR Camerons[tiab] OR Cape Verde[tiab] OR Central African Republic[tiab] OR Chad[tiab] OR Chile[tiab] OR China[tiab] OR Colombia[tiab] OR Comoros[tiab] OR Comoro Islands[tiab] OR Comores[tiab] OR Mayotte[tiab] OR Congo[tiab] OR Zaire[tiab] OR Costa

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Coast" OR croatia OR cuba OR cyprus OR czechoslovakia OR "Czech Republic" OR slovakia OR "Slovak Republic" OR djibouti OR "French Somaliland" OR dominica OR "Dominican Republic" OR "East Timor" OR "East Timor" OR "Timor Leste" OR ecuador OR egypt OR "United Arab Republic" OR "El Salvador" OR eritrea OR estonia OR ethiopia OR fiji OR gabon OR "Gabonese Republic" OR gambia OR gaza OR georgia AND republic OR georgian AND republic OR ghana OR gold AND coast OR greece OR grenada OR guatemala OR guinea OR guam OR guiana OR guyana OR haiti OR honduras OR hungary OR india OR maldives OR indonesia OR iran OR iraq OR "Isle of Man" OR jamaica OR jordan OR kazakhstan OR kazakh OR kenya OR kiribati OR korea OR kosovo OR kyrgyzstan OR kirghizia OR kyrgyz AND republic OR kirghiz OR kirgizstan OR "Lao PDR" OR laos OR latvia OR lebanon OR lesotho OR basutoland OR liberia OR libya OR lithuania OR macedonia OR madagascar OR "Malagasy Republic" OR malaysia OR malaya OR malay OR sabah OR sarawak OR malawi OR nyasaland OR mali OR malta OR marshall AND islands OR mauritania OR mauritius OR "Agalega Islands" OR mexico OR micronesia OR middle AND east OR moldova OR moldovia OR moldovian OR mongolia OR montenegro OR morocco OR ifni OR mozambique OR myanmar OR myanma OR burma OR namibia OR nepal OR netherlands AND antilles OR "New Caledonia" OR nicaragua OR niger OR nigeria OR "Northern Mariana Islands" OR oman OR muscat OR pakistan OR palau OR palestine OR panama OR paraguay OR peru OR philippines OR philipines OR phillipines OR poland OR portugal OR "Puerto Rico" OR romania OR rumania OR roumania OR russia OR russian OR rwanda OR ruanda OR "Saint Kitts" OR "St Kitts" OR nevis OR "Saint Lucia" OR "St Lucia" OR "Saint Vincent" OR "St Vincent" OR grenadines OR samoa OR "Samoan Islands" OR "Sao Tome" OR "Saudi Arabia" OR senegal OR serbia OR montenegro OR seychelles OR "Sierra Leone" OR slovenia OR "Sri Lanka" OR ceylon OR "Solomon Islands" OR somalia OR sudan OR suriname OR surinam OR swaziland OR syria OR tajikistan OR tadjikistan OR tadjikistan OR tadjik OR tanzania OR thailand OR togo OR "Togolese Republic" OR tonga OR trinidad OR tobago OR tunisia OR turkey OR turkmenistan OR turkmen OR uganda OR ukraine OR uruguay OR ussr OR "Soviet Union" OR "Union of Soviet Socialist Republics" OR uzbekistan OR uzbek OR vanuatu OR "New Hebrides" OR venezuela OR vietnam OR "Viet Nam" OR "West Bank" OR yemen OR yugoslavia OR zambia OR zimbabwe OR rhodesia) OR ("developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed country" OR "lesser developed countries" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "under developed country" OR "under developed countries" OR "under developed nation" OR "under developed nations" OR "under developed population" OR "under developed populations" OR "under developed world" OR "underdeveloped country" OR "underdeveloped countries" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world" OR "middle income country" OR "middle income countries" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "low income country" OR "low income countries" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower income

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S3 (therapy OR "parenting program*" OR education OR training OR intervention)

S2 ("developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed country" OR "lesser developed countries" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "under developed country" OR "under developed countries" OR "under developed nation" OR "under developed nations" OR "under developed population" OR "under developed populations" OR "under developed world" OR "underdeveloped country" OR "underdeveloped countries" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world"

OR "middle income country" OR "middle income countries" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "low income country" OR "low income countries" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower income country" OR "lower income countries" OR "lower income nation" OR "lower income nations" OR "lower income population" OR "lower income populations" OR "underserved country" OR "underserved countries" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world" OR "under served country" OR "under served countries" OR "under served nation" OR "under served nations" OR "under served population" OR "under served populations" OR "under served world" OR "deprived country" OR "deprived countries" OR "deprived nation" OR "deprived nations" OR "deprived population" OR "deprived populations" OR "deprived world" OR "poor country" OR "poor countries" OR "poor nation" OR "poor nations" OR "poor population" OR "poor populations" OR "poor world" OR "poorer country" OR "poorer countries" OR "poorer nation" OR "poorer nations" OR "poorer population" OR "poorer populations" OR "poorer world" OR "developing economy" OR "developing economies" OR "less developed economy" OR "less developed economies" OR "lesser developed economy" OR "lesser developed economies" OR "under developed economy" OR "under developed economies" OR "underdeveloped economy" OR "underdeveloped economies" OR "middle income economy" OR "middle income economies" OR "low income economy" OR "low income economies" OR "lower income economy" OR "lower income economies" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR lmic OR lmic OR "third world" OR "lami country" OR "lami countries" OR "transitional country" OR "transitional countries") OR (Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Urundi OR Cambodia OR Khmer Republic OR Kampuchea OR Cameroon OR Cameroons OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Mayotte OR Congo OR Zaire OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Timor Leste OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR Gaza OR Georgia Republic OR Georgian Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania) OR (Macedonia OR Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldovia OR Moldovan OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR (Navigator AND Island) OR (Navigator AND Islands) OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR

Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadjikistan OR Tadjikistan OR Tadjik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia)

S1 (infant OR infancy OR baby OR "caregiver-child" OR "mother-infant" OR "caregiver-infant" OR "mother-baby" OR "parent-infant" OR "parent-child" OR "toddler")

PsycARTICLES (7.10.17)

S9 S5 AND S7

S8 S3 AND S7

S7 S1 AND S2 AND S6

S6 (infant AND infancy OR baby OR "caregiver-child" OR "mother-infant" OR "caregiver-infant" OR "mother-baby" OR "parent-infant" OR "parent-child" OR "toddler")

S5 S3 OR S4

S4 ("developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed country" OR "lesser developed countries" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "under developed country" OR "under developed countries" OR "under developed nation" OR "under developed nations" OR "under developed population" OR "under developed populations" OR "under developed world" OR "underdeveloped country" OR "underdeveloped countries" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world" OR "middle income country" OR "middle income countries" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "low income country" OR "low income countries" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower income country" OR "lower income countries" OR "lower income nation" OR "lower income nations" OR "lower income population" OR "lower income populations" OR "underserved country" OR "underserved countries" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world" OR "under served country" OR "under served countries" OR "under served nation" OR "under served nations" OR "under served population" OR "under served populations" OR "under served world" OR "deprived country" OR "deprived countries" OR "deprived nation" OR "deprived nations" OR "deprived population" OR "deprived populations" OR "deprived world" OR "poor country" OR "poor countries" OR "poor nation" OR "poor nations" OR "poor population" OR "poor populations" OR "poor world" OR "poorer country" OR "poorer countries" OR "poorer nation" OR "poorer nations" OR "poorer population" OR "poorer populations" OR "poorer world" OR "developing economy" OR "developing economies" OR "less developed economy" OR "less developed economies" OR "lesser developed economy" OR "lesser developed economies" OR "under developed economy" OR "under developed economies" OR "underdeveloped economy" OR "underdeveloped economies" OR "middle income economy" OR "middle income economies" OR "low income economy" OR "low income economies" OR "lower income economy" OR "lower income economies" OR "low gdp" OR

"low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR lmic OR lmics OR "third world" OR "lami country" OR "lami countries" OR "transitional country" OR "transitional countries"

S2: (therapy OR "parenting program*" OR education OR training OR intervention)

S1 : (sensitiv* OR relationship OR nurtur* OR "behaviour" OR responsiv* OR "emotional availab*" OR "infant mental health" OR attachment OR "sensitive caregiving" OR "responsive caregiving" OR secure)

Africa-Wide (9.10.17)

S1. infant AND infancy OR baby OR "caregiver-child" OR "mother-infant" OR "caregiver-infant" OR "mother-baby" OR "parent-infant" OR "parent-child" OR "toddler")

S2. (therapy OR "parenting program*" OR education OR training OR intervention)

S3.
(sensitiv* OR relationship OR nurtur* OR "behaviour" OR responsiv* OR "emotional availab*" OR "infant mental health" OR attachment OR "sensitive caregiving" OR "responsive caregiving" OR secure)

S4. ("developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed country" OR "lesser developed countries" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "under developed country" OR "under developed countries" OR "under developed nation" OR "under developed nations" OR "under developed population" OR "under developed populations" OR "under developed world" OR "underdeveloped country" OR "underdeveloped countries" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world" OR "middle income country" OR "middle income countries" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "low income country" OR "low income countries" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower income country" OR "lower income countries" OR "lower income nation" OR "lower income nations" OR "lower income population" OR "lower income populations" OR "underserved country" OR "underserved countries" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world" OR "under served country" OR "under served countries" OR "under served nation" OR "under served nations" OR "under served population" OR "under served populations" OR "under served world" OR "deprived country" OR "deprived countries" OR "deprived nation" OR "deprived nations" OR "deprived population" OR "deprived populations" OR "deprived world" OR "poor country" OR "poor countries" OR "poor nation" OR "poor nations" OR "poor population" OR "poor populations" OR "poor world" OR "poorer country" OR "poorer countries" OR "poorer nation" OR "poorer nations" OR "poorer population" OR "poorer populations" OR "poorer world" OR "developing economy" OR "developing economies" OR "less developed economy" OR "less developed economies" OR "lesser developed economy" OR "lesser developed economies" OR "under developed economy" OR "under developed economies" OR "underdeveloped economy" OR "underdeveloped economies" OR "middle income economy" OR "middle income economies" OR "low income economy" OR "low income economies" OR "lower income economy" OR "lower income economies" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR lmic OR lmics OR "third world" OR "lami country" OR "lami countries" OR "transitional country" OR "transitional countries"

S5. (Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Urundi OR Cambodia OR Khmer Republic OR Kampuchea OR Cameroon OR Cameroons OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Mayotte OR Congo OR Zaire OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Timor Leste OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR Gaza OR Georgia Republic OR Georgian Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR (Navigator AND Island) OR (Navigator AND Islands) OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadjhikistan OR Tadjikistan OR Tadhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia)

S6. S4 OR S5

CINAHL (12.10.17)

- S1.
infant AND infancy OR baby OR "caregiver-child" OR "mother-infant" OR "caregiver-infant" OR "mother-baby" OR "parent-infant" OR "parent-child" OR "toddler")
- S2. ("developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed country" OR "lesser developed countries" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "under developed

country" OR "under developed countries" OR "under developed nation" OR "under developed nations" OR "under developed population" OR "under developed populations" OR "under developed world" OR "underdeveloped country" OR "underdeveloped countries" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world" OR "middle income country" OR "middle income countries" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "low income country" OR "low income countries" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower income country" OR "lower income countries" OR "lower income nation" OR "lower income nations" OR "lower income population" OR "lower income populations" OR "underserved country" OR "underserved countries" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world" OR "under served country" OR "under served countries" OR "under served nation" OR "under served nations" OR "under served population" OR "under served populations" OR "under served world" OR "deprived country" OR "deprived countries" OR "deprived nation" OR "deprived nations" OR "deprived population" OR "deprived populations" OR "deprived world" OR "poor country" OR "poor countries" OR "poor nation" OR "poor nations" OR "poor population" OR "poor populations" OR "poor world" OR "poorer country" OR "poorer countries" OR "poorer nation" OR "poorer nations" OR "poorer population" OR "poorer populations" OR "poorer world" OR "developing economy" OR "developing economies" OR "less developed economy" OR "less developed economies" OR "lesser developed economy" OR "lesser developed economies" OR "under developed economy" OR "under developed economies" OR "underdeveloped economy" OR "underdeveloped economies" OR "middle income economy" OR "middle income economies" OR "low income economy" OR "low income economies" OR "lower income economy" OR "lower income economies" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR lmic OR lmic OR "third world" OR "lami country" OR "lami countries" OR "transitional country" OR "transitional countries"

S3. Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Urundi OR Cambodia OR Khmer Republic OR Kampuchea OR Cameroon OR Camerouns OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Mayotte OR Congo OR Zaire OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Timor Leste OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR Gaza OR Georgia Republic OR Georgian Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR

Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR (Navigator AND Island) OR (Navigator AND Islands) OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadhikistan OR Tadjikistan OR Tadhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia)

S4. (therapy OR "parenting program*" OR education OR training OR intervention)

S5. sensitiv* OR relationship OR nurtur* OR "behaviour" OR responsiv* OR "emotional availab*" OR "infant mental health" OR attachment OR "sensitive caregiving" OR "responsive caregiving" OR secure)

S6. S2 OR S3

S7. S1 AND S4 AND S5 AND S6

S8. S1 AND S4 AND S5 AND S6

Health Source (10.10.17)

S1. (infant AND infancy OR baby OR "caregiver-child" OR "mother-infant" OR "caregiver-infant" OR "mother-baby" OR "parent-infant" OR "parent-child" OR "toddler")

S2.

("developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed country" OR "lesser developed countries" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "under developed country" OR "under developed countries" OR "under developed nation" OR "under developed nations" OR "under developed population" OR "under developed populations" OR "under developed world" OR "underdeveloped country" OR "underdeveloped countries" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world" OR "middle income country" OR "middle income countries" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "low income country" OR "low income countries" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower income country" OR "lower income countries" OR "lower income nation" OR "lower income nations" OR "lower income population" OR "lower income populations" OR "underserved country" OR "underserved countries" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world" OR "under served country" OR "under served countries" OR "under served nation" OR "under served nations" OR "under served population" OR "under served populations" OR "under served world" OR "deprived country" OR "deprived countries" OR "deprived nation" OR "deprived nations" OR "deprived population" OR "deprived populations" OR "deprived world" OR "poor country" OR "poor countries" OR "poor nation" OR "poor nations" OR "poor

population" OR "poor populations" OR "poor world" OR "poorer country" OR "poorer countries" OR "poorer nation" OR "poorer nations" OR "poorer population" OR "poorer populations" OR "poorer world" OR "developing economy" OR "developing economies" OR "less developed economy" OR "less developed economies" OR "lesser developed economy" OR "lesser developed economies" OR "under developed economy" OR "under developed economies" OR "underdeveloped economy" OR "underdeveloped economies" OR "middle income economy" OR "middle income economies" OR "low income economy" OR "low income economies" OR "lower income economy" OR "lower income economies" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR lmic OR lmic OR "third world" OR "lami country" OR "lami countries" OR "transitional country" OR "transitional countries"

S3. (therapy OR "parenting program*" OR education OR training OR intervention)

S4. (sensitiv* OR relationship OR nurtur* OR "behaviour" OR responsiv* OR "emotional availab*" OR "infant mental health" OR attachment OR "sensitive caregiving" OR "responsive caregiving" OR secure)

S5. (Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Urundi OR Cambodia OR Khmer Republic OR Kampuchea OR Cameroon OR Cameroons OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Mayotte OR Congo OR Zaire OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Timor Leste OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR Gaza OR Georgia Republic OR Georgian Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR (Navigator AND Island) OR (Navigator AND Islands) OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadjhikistan OR Tadjikistan OR Tadjhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New

Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia

S6. S2 OR S5

S7. S1 AND S3 AND S4 AND S6

ERIC (24.10.17)

S8. (infant AND infancy OR baby OR “caregiver-child” OR “mother-infant” OR “caregiver-infant” OR “mother-baby” OR “parent-infant” OR “parent-child” OR “toddler”)

S9.

"developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed country" OR "lesser developed countries" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "under developed country" OR "under developed countries" OR "under developed nation" OR "under developed nations" OR "under developed population" OR "under developed populations" OR "under developed world" OR "underdeveloped country" OR "underdeveloped countries" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world" OR "middle income country" OR "middle income countries" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "low income country" OR "low income countries" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower income country" OR "lower income countries" OR "lower income nation" OR "lower income nations" OR "lower income population" OR "lower income populations" OR "underserved country" OR "underserved countries" OR "underserved nation" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "underserved world" OR "under served country" OR "under served countries" OR "under served nation" OR "under served nations" OR "under served population" OR "under served populations" OR "under served world" OR "deprived country" OR "deprived countries" OR "deprived nation" OR "deprived nations" OR "deprived population" OR "deprived populations" OR "deprived world" OR "poor country" OR "poor countries" OR "poor nation" OR "poor nations" OR "poor population" OR "poor populations" OR "poor world" OR "poorer country" OR "poorer countries" OR "poorer nation" OR "poorer nations" OR "poorer population" OR "poorer populations" OR "poorer world" OR "developing economy" OR "developing economies" OR "less developed economy" OR "less developed economies" OR "lesser developed economy" OR "lesser developed economies" OR "under developed economy" OR "under developed economies" OR "underdeveloped economy" OR "underdeveloped economies" OR "middle income economy" OR "middle income economies" OR "low income economy" OR "low income economies" OR "lower income economy" OR "lower income economies" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gnp" OR "lower gross domestic" OR "lower gross national" OR lmic OR lmics OR "third world" OR "lami country" OR "lami countries" OR "transitional country" OR "transitional countries"

S10.

Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR

Burkina Faso OR Upper Volta OR Burundi OR Urundi OR Cambodia OR Khmer Republic OR Kampuchea OR Cameroon OR Cameroons OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Mayotte OR Congo OR Zaire OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Timor Leste OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR Gaza OR Georgia Republic OR Georgian Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldavia OR Moldovan OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR (Navigator AND Island) OR (Navigator AND Islands) OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadjikistan OR Tadjikistan OR Tadjhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia

S11. therapy OR "parenting program*" OR education OR training OR intervention

S12. sensitiv* OR relationship OR nurtur* OR "behaviour" OR responsiv* OR "emotional availab*" OR "infant mental health" OR attachment OR "sensitive caregiving" OR "responsive caregiving" OR secure

S13. S9 OR S10

S14. S8 AND S11 AND S12 AND S13

SocINDEX (26.10.17)

S1. (infant AND infancy OR baby OR "caregiver-child" OR "mother-infant" OR "caregiver-infant" OR "mother-baby" OR "parent-infant" OR "parent-child" OR "toddler")

S2.
("developing country" OR "developing countries" OR "developing nation" OR "developing nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed population" OR "less developed populations" OR "less developed world" OR "lesser developed country" OR "lesser developed countries" OR "lesser developed nation" OR "lesser developed nations" OR "lesser developed population" OR "lesser developed populations" OR "lesser developed world" OR "under developed

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S3. Africa OR Asia OR Caribbean OR West Indies OR South America OR Latin America OR Central America OR Afghanistan OR Albania OR Algeria OR Angola OR Antigua OR Barbuda OR Argentina OR Armenia OR Armenian OR Aruba OR Azerbaijan OR Bahrain OR Bangladesh OR Barbados OR Benin OR Byelarus OR Byelorussian OR Belarus OR Belorussian OR Belorussia OR Belize OR Bhutan OR Bolivia OR Bosnia OR Herzegovina OR Hercegovina OR Botswana OR Brasil OR Brazil OR Bulgaria OR Burkina Faso OR Burkina Fasso OR Upper Volta OR Burundi OR Urundi OR Cambodia OR Khmer Republic OR Kampuchea OR Cameroon OR Camerouns OR Cape Verde OR Central African Republic OR Chad OR Chile OR China OR Colombia OR Comoros OR Comoro Islands OR Comores OR Mayotte OR Congo OR Zaire OR Costa Rica OR Cote d'Ivoire OR Ivory Coast OR Croatia OR Cuba OR Cyprus OR Czechoslovakia OR Czech Republic OR Slovakia OR Slovak Republic OR Djibouti OR French Somaliland OR Dominica OR Dominican Republic OR East Timor OR East Timur OR Timor Leste OR Ecuador OR Egypt OR United Arab Republic OR El Salvador OR Eritrea OR Estonia OR Ethiopia OR Fiji OR Gabon OR Gabonese Republic OR Gambia OR Gaza OR Georgia Republic OR Georgian Republic OR Ghana OR Gold Coast OR Greece OR Grenada OR Guatemala OR Guinea OR Guam OR Guiana OR Guyana OR Haiti OR Honduras OR Hungary OR India OR Maldives OR Indonesia OR Iran OR Iraq OR Isle of Man OR Jamaica OR Jordan OR Kazakhstan OR Kazakh OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyzstan OR Kirghizia OR Kyrgyz Republic OR Kirghiz OR Kirgizstan OR "Lao PDR" OR Laos OR Latvia OR Lebanon OR Lesotho OR Basutoland OR Liberia OR Libya OR Lithuania OR Macedonia OR Madagascar OR Malagasy Republic OR Malaysia OR Malaya OR Malay OR Sabah OR Sarawak OR Malawi OR Nyasaland OR Mali OR Malta OR Marshall Islands OR Mauritania OR Mauritius OR Agalega Islands OR Mexico OR Micronesia OR Middle East OR Moldova OR Moldovia OR Moldovian OR Mongolia OR Montenegro OR Morocco OR Ifni OR Mozambique OR Myanmar OR Myanma OR Burma OR Namibia OR Nepal OR Netherlands Antilles OR New Caledonia OR Nicaragua OR Niger OR Nigeria OR Northern Mariana Islands OR Oman OR Muscat OR Pakistan OR

Palau OR Palestine OR Panama OR Paraguay OR Peru OR Philippines OR Philipines OR Phillipines OR Phillippines OR Poland OR Portugal OR Puerto Rico OR Romania OR Rumania OR Roumania OR Russia OR Russian OR Rwanda OR Ruanda OR Saint Kitts OR St Kitts OR Nevis OR Saint Lucia OR St Lucia OR Saint Vincent OR St Vincent OR Grenadines OR Samoa OR Samoan Islands OR (Navigator AND Island) OR (Navigator AND Islands) OR Sao Tome OR Saudi Arabia OR Senegal OR Serbia OR Montenegro OR Seychelles OR Sierra Leone OR Slovenia OR Sri Lanka OR Ceylon OR Solomon Islands OR Somalia OR Sudan OR Suriname OR Surinam OR Swaziland OR Syria OR Tajikistan OR Tadhikistan OR Tadjikistan OR Tadhik OR Tanzania OR Thailand OR Togo OR Togolese Republic OR Tonga OR Trinidad OR Tobago OR Tunisia OR Turkey OR Turkmenistan OR Turkmen OR Uganda OR Ukraine OR Uruguay OR USSR OR Soviet Union OR Union of Soviet Socialist Republics OR Uzbekistan OR Uzbek OR Vanuatu OR New Hebrides OR Venezuela OR Vietnam OR Viet Nam OR West Bank OR Yemen OR Yugoslavia OR Zambia OR Zimbabwe OR Rhodesia

S4. (therapy OR "parenting program*" OR education OR training OR intervention)

S5. (sensitiv* OR relationship OR nurtur* OR "behaviour" OR responsiv* OR "emotional availab*" OR "infant mental health" OR attachment OR "sensitive caregiving" OR "responsive caregiving" OR secure)

S6. S2 OR S3

S7.

S1 AND S4 AND S5 AND S6

Cochrane Library (3.11.17)

1. infant and infancy or baby or "caregiver-child" or "mother-infant" or "caregiver-infant" or "mother-baby" or "parent-infant" or "parent-child" or toddler (Word variations have been searched)
2. "developing country" or "developing countries" or "developing nation" or "developing nations" or "developing population" or "developing populations" or "developing world" or "less developed country" or "less developed countries" or "less developed nation" or "less developed nations" or "less developed population" or "less developed populations" or "less developed world" or "lesser developed country" or "lesser developed countries" or "lesser developed nation" or "lesser developed nations" or "lesser developed population" or "lesser developed populations" or "lesser developed world" or "under developed country" or "under developed countries" or "under developed nation" or "under developed nations" or "under developed population" or "under developed populations" or "under developed world" or "underdeveloped country" or "underdeveloped countries" or "underdeveloped nation" or "underdeveloped nations" or "underdeveloped population" or "underdeveloped populations" or "underdeveloped world" or "middle income country" or "middle income countries" or "middle income nation" or "middle income nations" or "middle income population" or "middle income populations" or "low income country" or "low income countries" or "low income nation" or "low income nations" or "low income population" or "low income populations" or "lower income country" or "lower income countries" or "lower income nation" or "lower income nations" or "lower income population" or "lower income populations" or "underserved country" or "underserved countries" or "underserved nation" or "underserved nations" or "underserved population" or "underserved populations" or "underserved world" or "under served country" or "under served countries" or "under served nation" or "under served nations" or "under served population" or "under served populations" or "under served world" or "deprived country" or "deprived countries" or "deprived nation" or "deprived nations" or "deprived population" or "deprived populations" or "deprived world" or "poor country" or "poor countries" or "poor nation" or "poor nations" or "poor population" or "poor populations" or "poor world" or "poorer country" or "poorer countries" or "poorer nation" or "poorer nations" or "poorer population" or "poorer

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3. Africa or Asia or Caribbean or West Indies or South America or Latin America or Central America or Afghanistan or Albania or Algeria or Angola or Antigua or Barbuda or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bahrain or Bangladesh or Barbados or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brasil or Brazil or Bulgaria or Burkina Faso or Burkina Fasso or Upper Volta or Burundi or Urundi or Cambodia or Khmer Republic or Kampuchea or Cameroon or Cameroons or Cape Verde or Central African Republic or Chad or Chile or China or Colombia or Comoros or Comoro Islands or Comores or Mayotte or Congo or Zaire or Costa Rica or Cote d'Ivoire or Ivory Coast or Croatia or Cuba or Cyprus or Czechoslovakia or Czech Republic or Slovakia or Slovak Republic or Djibouti or French Somaliland or Dominica or Dominican Republic or East Timor or East Timur or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Estonia or Ethiopia or Fiji or Gabon or Gabonese Republic or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Gold Coast or Greece or Grenada or Guatemala or Guinea or Guam or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or Isle of Man or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or Kirghiz or Kirgizstan or "Lao PDR" or Laos or Latvia or Lebanon or Lesotho or Basutoland or Liberia or Libya or Lithuania or Macedonia or Madagascar or Malagasy Republic or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Nyasaland or Mali or Malta or Marshall Islands or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Middle East or Moldova or Moldovia or Moldovian or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Netherlands Antilles or New Caledonia or Nicaragua or Niger or Nigeria or Northern Mariana Islands or Oman or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Poland or Portugal or Puerto Rico or Romania or Rumania or Roumania or Russia or Russian or Rwanda or Ruanda or Saint Kitts or St Kitts or Nevis or Saint Lucia or St Lucia or Saint Vincent or St Vincent or Grenadines or Samoa or Samoan Islands or (Navigator and Island) or (Navigator and Islands) or Sao Tome or Saudi Arabia or Senegal or Serbia or Montenegro or Seychelles or Sierra Leone or Slovenia or Sri Lanka or Ceylon or Solomon Islands or Somalia or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadzhi-kistan or Tadjikistan or Tadzhi-k or Tanzania or Thailand or Togo or Togolese Republic or Tonga or Trinidad or Tobago or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uruguay or USSR or Soviet Union or Union of Soviet Socialist Republics or Uzbekistan or Uzbek or Vanuatu or New Hebrides or Venezuela or Vietnam or Viet Nam or West Bank or Yemen or Yugoslavia or Zambia or Zimbabwe or Rhodesia
4. therapy or "parenting program*" or education or training or intervention
5. sensitiv* or relationship or nurtur* or "behaviour" or responsiv* or "emotional availab*" or "infant mental health" or attachment or "sensitive caregiving" or "responsive caregiving" or secure
6. #2 or #3
7. #1 and #6 and #5 and #4

Additional File 2: Table of Excluded Articles

Table of Excluded articles		
<i>Articles that had abstracts that met the criteria but were subsequently excluded on further review of the article.</i>		
	Article	Reason for exclusion
1	Aboud, F. E., Singla, D. R., Nahil, M. I., & Borisova, I. (2013). Effectiveness of a parenting program in Bangladesh to address early childhood health, growth and development. <i>Social Science and Medicine</i> , 97, 250-258. doi:10.1016/j.socscimed.2013.06.020	Did not measure responsiveness, attachment or any relationship outcomes.
2	Al-Hassan, S. M., & Lansford, J. E. (2011). Evaluation of the Better Parenting Programme in Jordan. <i>Early Child Development and Care</i> , 181(5), 587-598.	Age range Did not measure responsiveness, attachment or any relationship outcomes.
3	Ammaniti, M., Speranza, A. M., Tambelli, R., Muscetta, S., Lucarelli, L., Vismara, L., . . . Cimino, S. (2006). A prevention and promotion intervention program in the field of mother–infant relationship. <i>Infant Ment Health J</i> , 27(1), 70-90.	High-income country population
4	Bain, K., Dawson, N., Esterhuizen, M., Frost, K., & Pininski, D. (2017). ‘Abazali abazamayo’ (parents who keep on trying): mothers' responses to the Ububele Mother-Baby Home Visiting Programme. <i>Early Child Development and Care</i> , 187(1), 13-34. doi:10.1080/03004430.2016.1150271	Did not measure responsiveness, attachment or any relationship outcomes.
5	Bain, K., Rosenbaum, L., Frost, K., & Esterhuizen, M. (2012). 'The mothers have mercy for me': change in parent-infant relationships through group psychotherapy. <i>Psycho-analytic Psychotherapy in South Africa</i> , 20, 33-68.	Special populations No outcome measures.
6	Bakermans-Kranenburg, M. J., Van Ijzendoorn, M. H., & Juffer, F. (2003). Less is more: meta-analyses of sensitivity and attachment interventions in early childhood. <i>Psychol Bull</i> , 129(2), 195.	Age range broader Mixed LMIC & High-Income data
7	Barlow, J., Bennett, C., Midgley, N., Larkin, S. K., & Wei, Y. (2015). Parent-infant psychotherapy for improving parental and infant mental health. <i>Cochrane Database of Systematic Reviews</i> , (1). Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD010534.pub2/abstract doi:10.1002/14651858.CD010534.pub2	High-income country population
8	Barlow, J., Smailagic, N., Bennett, C., Huband, N., Jones, H., & Coren, E. (2011). Individual and group based parenting programmes for improving psychosocial outcomes for teenage parents and their children. <i>Cochrane Database of Systematic Reviews</i> , (3). Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD002964.pub2/abstract doi:10.1002/14651858.CD002964.pub2	High-income country population

9	Bekman, S., & Koçak, A. A. (2013). Mothers' experiences with a mother–child education programme in five countries. <i>International Journal of Early Years Education</i> , 21(2-3), 223-243. doi:10.1080/09669760.2013.832942	Age range Mixed LMIC & High-Income data
10	Bennett, C., Underdown, A., & Barlow, J. (2013). Massage for promoting mental and physical health in typically developing infants under the age of six months. <i>Cochrane Database of Systematic Reviews</i> , (4). Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD005038.pub3/abstract doi:10.1002/14651858.CD005038.pub3	Mixed LMIC & High-Income data
11	Berg, A. (2002). Talking with infants: A bridge to cross-cultural intervention. <i>Southern African Journal of Child and Adolescent Mental Health</i> , 14(1), 5-14.	Not an intervention study
12	Berg, A. (2012). Infant-parent psychotherapy at primary care level: establishment of a service. <i>S A M J South African Medical Journal</i> , 102(6), 582-584.	Special Populations
13	Berge, J. M., Law, D. D., Johnson, J., & Wells, M. G. (2010). Effectiveness of a psychoeducational parenting group on child, parent, and family behavior: a pilot study in a family practice clinic with an underserved population. <i>Families, Systems, & Health</i> , 28(3), 224.	High-income country population
14	Brophy-Herb, H. E., Stansbury, K., Bocknek, E., & Horodynski, M. A. (2012). Modeling maternal emotion-related socialization behaviors in a low-income sample: Relations with toddlers' self-regulation. <i>Early Childhood Research Quarterly</i> , 27(3), 352-364. doi:10.1016/j.ecresq.2011.11.005	High-income Country Population
15	Bryant, J. H., Bryant, N. H., Williams, S., Ndambuki, R. N., & Erwin, P. C. (2012). Addressing social determinants of health by integrating assessment of caregiver-child attachment into community based primary health care in urban Kenya. <i>Int J Environ Res Public Health</i> , 9(10), 3588-3598.	Age range too broad
16	Bryanton, J., Beck, C. T., & Montelpare, W. (2013). Postnatal parental education for optimizing infant general health and parent-infant relationships. <i>Cochrane Database of Systematic Reviews</i> , (11). Retrieved from http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD004068.pub4/abstract doi:10.1002/14651858.CD004068.pub4	Mixed LMIC & High-Income data Measures focused on other outcomes
17	Cohen, N. J., Muir, E., Lojkasek, M., Muir, R., Parker, C. J., Barwick, M., & Brown, M. (1999). Watch, wait, and wonder: Testing the effectiveness of a new approach to mother-infant psychotherapy. <i>Infant Ment Health J</i> , 20(4), 429-451.	High-income country population Age range too broad
18	Cook-Darzens, S., & Brunod, R. (1999). An Ecosystemic Approach to Improving Mother-Infant Attachment in a Caribbean Matrifocal Society. <i>Contemporary Family Therapy: An International Journal</i> , 21(4), 433.	Not an intervention study Age range too broad
19	Dawson, N., Richards, J., & Frost, K. (2017). The Ububele Baby Mat Service—A primary preventative mental health intervention in a culturally diverse setting. <i>J Child Adolesc Ment Health</i> , 29(1), 85-97. doi:10.2989/17280583.2017.1297308	No outcome measures
20	Else-Quest, N. M., Hyde, J. S., & Clark, R. (2003). Breastfeeding, Bonding, and the Mother-infant Relationship. <i>Merrill-Palmer Quarterly</i> , 49(4), 495-517.	High-income country population

21	Eshel, N., Daelman, B., de Mello, M. C., & Martines, J. (2006). Responsive parenting: interventions and outcomes. <i>Bulletin of the World Health Organization</i> , 84(12), 991-998.	Mixed LMIC & High-Income data
22	Fernandez-Rao, S., Hurley, K. M., Nair, K. M., Balakrishna, N., Radhakrishna, K. V., Ravinder, P., . . . Black, M. M. (2014) Integrating nutrition and early child-development interventions among infants and preschoolers in rural India. Vol. 1308. <i>Annals of the New York Academy of Sciences</i> (pp. 218-231).	Descriptive paper that does not include the detailed outcomes of the study
23	Gray Armstrong, V., & Howatson, R. (2015). Parent-infant art psychotherapy: a creative dyadic approach to early intervention. <i>Infant Ment Health J</i> , 36(2), 213-222. doi:10.1002/imhj.21504	High-income country population
24	Groeneveld, M. G., Vermeer, H. J., van IJzendoorn, M. H., & Linting, M. (2010). Children's wellbeing and cortisol levels in home-based and center-based childcare. <i>Early Childhood Research Quarterly</i> , 25(4), 502-514.	High-income country population
25	Habibov, N. N. (2012). Does childcare have an impact on the quality of parent-child interaction? Evidence from post-Soviet Kyrgyzstan, Tajikistan, and Uzbekistan. <i>Children and Youth Services Review</i> , 34(12), 2367-2373. doi:10.1016/j.childyouth.2012.09.004	Older children
26	Habibov, N., & Coyle, J. (2014). Effect of Early Child Care and Education Attendance Hours on Parent-Child Interaction in Central Asia: Evaluation of Multiple Indicator Cluster Surveys. <i>Child & Youth Services</i> , 35(2), 169-191. doi:10.1080/0145935X.2014.924347	Older children
27	Holmes, J. (2012). A model of intervention at a psychoanalytic parent/child drop-in group in a poor district of Lima, Peru. <i>Journal of Child Psychotherapy</i> , 38(2), 170-184. doi:10.1080/0075417X.2012.684487	Not an intervention study No outcome measures
28	Klein, P. S., & Rye, H. (2004). Interaction-oriented early intervention in Ethiopia: the MISC approach..More Intelligent and Sensitive Children. <i>Infants & Young Children: An Interdisciplinary Journal of Early Childhood Intervention</i> , 17(4), 340-354.	Age range
29	Kocak, A., & Bekman, S. (2004). Mothers Speaking: A Study on the Experience of Mothers within the Mother-Child Education Programme (MOCEP). <i>European Early Childhood Education Research Journal</i> , 12(1), 115-129.	Age range
30	Lee, P., Foley, S., & Mee, C. (2013). Getting it right from the start: evaluation of a DVD and booklet for new parents. <i>Community Pract</i> , 86(11), 32-36.	High-income country population
31	Lozoff, B., Smith, J. B., Clark, K. M., Perales, C. G., Rivera, F., & Castillo, M. (2010). Home intervention improves cognitive and social-emotional scores in iron-deficient anemic infants. <i>Pediatrics</i> , 126(4), e884-e894. doi:10.1542/peds.2009-3535	Special populations
32	Manz, P. H., Eisenberg, R., Gernhart, A., Faison, J., Laracy, S., Ridgard, T., & Pinho, T. (2017). Engaging Early Head Start parents in a collaborative inquiry: the co-construction of Little Talks. <i>Early Child Development and Care</i> , 187(8), 1311-1334. doi:10.1080/03004430.2016.1169177	High-income country population
33	Mejia, A., Calam, R., & Sanders, M. R. (2012). A review of parenting programs in developing countries: Opportunities and challenges for preventing emotional and behavioral difficulties in children. <i>Clinical Child and Family Psychology Review</i> , 15(2), 163-175. doi:10.1007/s10567-012-0116-9	Systematic review Not in English

34	Morawska, A., & Sanders, M. R. (2006). Self-administered behavioral family intervention for parents of toddlers: Part I. Efficacy. <i>J Consult Clin Psychol</i> , 74(1), 10-19. doi:10.1037/0022-006X.74.1.10	Older children High-income country population
35	Morris, A. S., Robinson, L. R., Hays-Grudo, J., Claussen, A. H., Hartwig, S. A., & Treat, A. E. (2017). Targeting parenting in early childhood: A public health approach to improve outcomes for children living in poverty. <i>Child development</i> , 88(2), 388-397. doi:10.1111/cdev.12743	Not an intervention study
36	Morris, J., Jones, L., Berrino, A., Jordans, M. J. D., Okema, L., & Crow, C. (2012). Does Combining Infant Stimulation With Emergency Feeding Improve Psychosocial Outcomes for Displaced Mothers and Babies? A Controlled Evaluation From Northern Uganda. <i>American Journal of Orthopsychiatry</i> , 82(3), 349-357. doi:10.1111/j.1939-0025.2012.01168.x	Did not measure responsivity, attachment or any relationship outcomes.
37	Negrão, M., Pereira, M., Soares, I., & Mesman, J. (2014). Enhancing positive parent-child interactions and family functioning in a poverty sample: A randomized control trial. <i>Attachment & human development</i> , 16(4), 315-328. doi:10.1080/14616734.2014.912485	High-income country population Age range
38	Obradovic, J., Yousafzai, A. K., Finch, J. E., & Rasheed, M. A. (2016). Maternal Scaffolding and Home Stimulation: Key Mediators of Early Intervention Effects on Children's Cognitive Development. <i>Developmental psychology</i> , 52(9), 1409-1421.	Did not measure responsivity, attachment or any relationship outcomes.
39	Pearson, S., Austin, A. M. B., De Aquino, C. N., & De Burró, E. U. (2008). Cognitive development and home environment of rural Paraguayan infants and toddlers participating in pastoral del niño, an early child development program. <i>Journal of Research in Childhood Education</i> , 22(4), 343-362. doi:10.1080/02568540809594632	No detail of what the intervention was Did not measure responsivity, attachment or any relationship outcomes.
40	Pontoppidan, M., Klest, S. K., & Sandoy, T. M. (2016). The incredible years parents and babies program: A pilot randomized controlled trial. <i>PloS one</i> , 11(12). doi:10.1371/journal.pone.0167592	High-income country population
41	Richter, L. (2004). The importance of caregiver-child interactions for the survival and healthy development of young children: a review.	Not an intervention study
42	Roia, A., Paviotti, E., Ferluga, V., Montico, M., Monasta, L., Ronfani, L., & Tamburlini, G. (2014). Promoting effective child development practices in the first year of life: Does timing make a difference? <i>BMC Pediatr</i> , 14(1). doi:10.1186/1471-2431-14-222	High-income country population
43	Sanders, M. R., Stallman, H. M., & McHale, M. (2011). Workplace Triple P: A controlled evaluation of a parenting intervention for working parents. <i>Journal of Family Psychology</i> , 25(4), 581-590. doi:10.1037/a0024148	High-income country population
44	Sleed, M., James, J., Baradon, T., Newbery, J., & Fonagy, P. (2013). A psychotherapeutic baby clinic in a hostel for homeless families: practice and evaluation. <i>Psychol Psychother</i> , 86(1), 1-18. doi:10.1111/j.2044-8341.2011.02050.x	High-income country population
45	Svanberg, P. O., Mennet, L., & Spieker, S. (2010). Promoting a secure attachment: A primary prevention practice model. <i>Clin Child Psychol Psychiatry</i> , 15(3), 363-378. doi:10.1177/1359104510367584	High-income country population

46	Tereno, S., Madigan, S., Lyons-Ruth, K., Plamondon, A., Atkinson, L., Guedeney, N., . . . Guedeney, A. (2017). Assessing a change mechanism in a randomized home-visiting trial: Reducing disrupted maternal communication decreases infant disorganization. <i>Development and psychopathology</i> , 29(2), 637-649. doi:10.1017/S0954579417000232	High-income country population
47	About FE and Akhter S. (2011) A cluster-randomized evaluation of a responsive stimulation and feeding intervention in Bangladesh. <i>Pediatrics</i> 127(5): e1191-e1197.	Not an intervention study
48	Vallotton, C.D. (2012). Infant signs as intervention? Promoting symbolic gestures for preverbal children in low-income families supports responsive parent-child relationships. <i>Early Childhood Research Quarterly</i> , 27(3), 401-415. doi:10.1016/j.ecresq.2012.01.003	High-income country population
49	van, I. M. H., Juffer, F., & Duyvesteyn, M. G. (1995). Breaking the intergenerational cycle of insecure attachment: a review of the effects of attachment-based interventions on maternal sensitivity and infant security. <i>J Child Psychol Psychiatry</i> , 36(2), 225-248.	High-income country populations Systematic review
50	Velderman, M. K., Bakermans-Kranenburg, M. J., Juffer, F., & van, I. M. H. (2006). Effects of attachment-based interventions on maternal sensitivity and infant attachment: differential susceptibility of highly reactive infants. <i>J Fam Psychol</i> , 20(2), 266-274. doi:10.1037/0893-3200.20.2.266	High-income country population
51	Wint, E., & Brown, J. (1987). Promoting Effective Parenting: A Study of Two Methods In Kingston, Jamaica. <i>Child Welfare</i> , 66(6), 507-516.	Broad age range Did not measure responsiveness, attachment or any relationship outcomes.
52	Yousafzai, A. K., Rasheed, M. A., Rizvi, A., Armstrong, R., & Bhutta, Z. A. (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-randomised factorial effectiveness trial. <i>Lancet</i> , 384(9950), 1282-1293.	Did not measure responsiveness, attachment or any relationship outcomes.
53	Yuan, S.-Y., & Freeman, R. (2011). Can social support in the guise of an oral health education intervention promote mother–infant bonding in Chinese immigrant mothers and their infants? <i>Health Education Journal</i> , 70(1), 57-66. doi:10.1177/0017896910366186	High-income country population

Additional File 3: Journal Submission Guidelines

Journal of Child Health Care

<https://uk.sagepub.com/en-gb/afr/journal/journal-child-health-care#submission-guidelines>

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