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Sensitivity and Attachment Interventions in Early Childhood: A Systematic Review and Meta-  
Analysis

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Short Title: Sensitivity and Attachment Interventions

## Abstract

A systematic review and meta-analysis of randomized controlled trials (RCT) was conducted to determine whether early interventions are effective in improving attachment security and parental sensitivity. Electronic databases were searched 2002-2015 onwards, All RCTs delivered to mothers, fathers or carers, before their child's mean age was 36 months, via 1:1 support, group work or guided self-help were included. The search was restricted to English Language publications. Study Selection, data extraction and quality appraisal were independently undertaken by two authors. With regard to analysis, where appropriate, dichotomous data were pooled using the Mantel- Haenszel odds ratio method and for continuous data descriptive statistics were collected in order to calculate standardized mean differences and effect sizes.

Four studies met inclusion criteria and were divided into two groups: North American & Canadian and South African based studies. Combining data from both groups indicates that early interventions improve attachment security and improves rates of disorganized attachment. One study provided extractable data on the outcome of parental sensitivity which shows that early interventions were effective in improving maternal sensitivity at 6 and 12 months. Study results generally support the findings of a previous review (Bakermans-Kranenburg, Ijzendoorn, & Juffer, 2003) which found that early interventions improved attachment security and maternal sensitivity.

Key words: attachment; parental sensitivity; early interventions; systematic review

## Background

Early interventions focusing on promoting parental functioning and secure infant attachment with young mothers, have developed significantly over the last few years informed by increasing recognition that brain development is most rapid in the first three years of life. It is therefore at this time when the greatest positive outcomes can be achieved, and subsequently, progress maintained throughout a child's lifespan (Sweet & Applebaum, 2004). It is a child's early experiences that can affect their long-term social, developmental, behavioral and health outcomes (Robinson et al, 2013). At risk families and those living in adversity often lack the resources and experience for achieving optimal wellbeing (Nievar, Van Egeren, & Pollard, 2010). Early interventions, often anchored within home visiting programmes, have shown positive effects on pregnancy outcomes, child abuse and neglect (Olds, Hill, Robinson, Song, & Little, 2000), A&E attendances, hospitalizations, immunization rates, parental knowledge and competence, maternal psychological health and maternal behaviour (Nievar et al, 2010). Montgomery et al. (2009) also report an improvement in parent-child interactions and mental health outcomes.

### *Home visiting interventions: the approach*

Since the mid-1990s, a range of home visiting and parenting programmes has evolved to address a range of issues and problems in the parent-infant relationship and parenting capacity and capability. Home visiting programmes and early interventions emphasize the importance of parental behaviour in influencing and improving the lives of children by directly targeting well studied mechanisms of risk in early childhood development which frequently focus on key domains of parent-child relationships (Olds et

al, 2000; Olds et al, 2004). Most home visiting programmes assume that vulnerable parents, lacking experience and resources, need additional support to promote their child's development (Olds et al, 2000). Home visiting programmes enable professionals to observe family dynamics and the environment in which the family lives, affording a better understanding of the needs of the family (Olds et al, 2000). Delivering support in the home also provides an opportunity to involve the whole family and is beneficial in building a therapeutic relationship (Sweet & Applebaum, 2004).

#### *Impact of home visiting programs: the current state of the evidence*

Home visiting programmes have been most extensively researched and studied over the past twenty years and deemed to be crucial to reaching disenfranchised and disadvantaged families across a range of communities internationally. Although a comprehensive review of these programs is not possible here, the interested reader is referred to Howard & Brooks-Gunn (2009) and Olds, Sadler, & Kitzman (2007). A number of studies has shown that visited families have significantly better outcomes than control families, with respect to a raft of diverse key outcomes including sensitive care giving, secure attachment, mother-child interactions, and child mental developmental outcomes at 24 months (Slade, 2005; Olds et al., 2002). Olds and colleagues have also found that home based intervention programmes had a number of health and social beneficial impacts: reduction in maternal smoking, preterm births, and emergency department visits for illness and injury in both infancy and childhood. In addition, mothers reported fewer subsequent pregnancies, increased employment, increased father involvement, and decreased time on welfare. These impacts were sustained in the long term: at 15 and 20 year follow-up,

mothers receiving home based intervention programmes were less likely to have abused or neglected their children, had become less reliant on welfare benefits, had fewer behaviour problems linked to substance abuse, had fewer arrests. These positive outcomes applied to their children who had fewer arrests, convictions, sex partners, and days of consuming alcohol (Kitzman et al., 2010; Olds et al., 2000; Olds et al., 2010).

In the UK, we have witnessed the implementation of the Family Nurse Partnership programme which has been driven by safeguarding children, particularly targeting young, inexperienced mothers, who are considered to be most vulnerable and at increased risk of poor outcomes (Robinson et al., 2013).

#### *Contemporary approaches to home visiting programmes*

Home visiting programmes and early interventions have previously focused on promoting sensitive care giving and optimum parenting, hence the promotion of positive maternal behavior which in turn led to a clinical emphasis on teaching parents and modifying behavior (Puckering, 2004). More recently, in the implementation of home visiting programmes, there has been a shift towards more relationship based, psychotherapeutic approaches promoting parental reflectiveness and or mentalization through relationships in order to promote positive parenting, attachment and maternal sensitivity (Munro, 2011). The 'Minding the Baby®' project commissioned by the National Society for the Prevention of Cruelty in Children (NSPCC) incorporates these types of approaches and is currently being piloted in the UK by the NSPCC (Sanger et al., 2015; NSPCC, 2015) having proven successful in the USA. This is an intensive, flexible, relationship-based, interdisciplinary, trauma-informed and mentalization-based programme, embedded

in community health care. Multi-level and modal types of inter-disciplinary interventions are delivered in partnership by an expert nurse or midwife and social worker. Results from the USA have found that following the intervention, mother-child interactions were less disrupted, infants were more likely to be classified as secure and less likely to be classified as disorganized in attachment style. Additionally, the mothers' level of reflective functioning improved and families were less likely to be referred to child protection services (Slade and Sadler, 2013). These reported findings indicate promising results for the pilot study currently being undertaken in the UK.

#### *Attachment & Reflective Functioning*

It is firmly established in the attachment field that the quality of the infant's attachment to their primary caregiver is robustly related to a range of child outcomes (Slade, 2005; Goldberg 2000). The type of caregiving an infant receives is now understood to be central to a preverbal set of expectations, or an internal working model of human interaction that the infant would develop and carry throughout life (Brandon et al, 2009). Furthermore, empirical findings have highlighted the role of the mother's own mental state with respect to attachment – referred to as her internal working model of attachment, in shaping the sensitivity of care, and thus her child's attachment security (De Wolf, & van Ijzendoorn, 1997). These attachment representations are thought to shape how a parent perceives their child and, accordingly, how they respond to the child's behaviour, cues and communications. Slade et al. (1999), Reynolds (2003) and Fonagy, Steele and Steele (1991) report that the security of a child's attachment, and the quality of the relationship between mother and child is predicted by the mother's ability to understand and reflect on her own early relationships and childhood experiences, i.e. through reflective functioning. Allowing

that reflective capacity underlies the development of social relationships (Slade, 2005) it follows that maternal reflective functioning influences the mother's attachment organization prenatally and the infants' attachment security (Reynolds, 2003). Evidence suggests that parents who are better at reflective functioning are more likely to be classified as a secure and autonomous and these parents are more likely to link mental states to behaviour in a meaningful and accurate way (Slade, 2005). Conversely, mothers who are classed as dismissing, have been shown to manifest a lack of attunement and have restricted patterns of communication (Fonagy et al, 1991).

### *Prenatal Maternal Representations*

The importance of the relationship between mother and infant, as conceptualized by attachment theory and the multiple approaches to capturing the attachment process have led to increased attention that this relationship begins before birth whilst the mother is pregnant and the child still a fetus.

During pregnancy, the majority of women form maternal representations of their unborn children by the second or third trimester (Ammaniti et al., 1992; Lumley, 1982). These representations are the mother's internal and subjective experiences of the relationship between herself and her child during pregnancy (Zeanah & Benoit, 1995). Like other types of internal working models, maternal representations of the child tend to be relatively stable after their formation and serve as a guide for later parent-child interactions (Bretherton, 1992; Dayton et al., 2010). A woman psychologically prepares for motherhood during pregnancy by reworking her representation of her own mother and simultaneously developing a representation of her unborn child and herself as a caregiver (Stern, 1995).



If maternal–fetal relationships are the beginnings of maternal conceptions about and interactions with the child, and they are associated with important outcomes for both mother and child in the perinatal period and beyond, then these conceptions themselves are important theoretically and clinically (Alhusen, Hayat, & Gross, 2013; Siddiqui & Hägglöf, 2000). It is also possible that interventions to influence prenatal attachment through the mother’s representation models or preventative strategies could be developed in cases where difficulties in prenatal attachment may occur.

#### *Paternal-fetal attachment*

It has also been hypothesized that, complementary to maternal fetal relationships, a paternal-fetal attachment process exists (Condon, 1993; Weaver and Cranley, 1983). Paternal adaptations of maternal fetal relationship measures have been subsequently included in empirical research and evaluations conducted in the antenatal period with a number of studies emphasizing its importance in the transition to parenthood.

To date, findings have been inconsistent, with some finding no difference in maternal-and paternal-fetal attachment (Wilson et al., 2000) and others finding maternal-fetal attachment scores to be greater than paternal scores (Pretorius et al., 2006).

#### *Why is this review needed now?*

Bull et al (2004) state that although extensively evaluated, there is a lack of high quality evidence on the effectiveness of home-based visiting programmes. In the UK and international context, there has been a shift in emphasis to targeted early intervention work and the need to develop and test empirically derived models that can support vulnerable

parents and their children (Field, 2010). Safeguarding is a key driver in Government commissioning home-based visiting services such as Family Nurse Partnership and more recently the NSPCC randomised control trial of the 'Minding the Baby<sup>®</sup>' intervention.

To date there has been only one systematic review of home visiting based parent-infant relationship based interventions (Bakermans-Kranenburg et al., 2003). The authors performed a meta-analysis of sensitivity and attachment interventions in early childhood. The results showed that attachment based interventions appeared to be effective in reducing insensitive parenting ( $d = 0.33$ ) and to a lesser effect infant attachment insecurity ( $d = 0.20$ ). With further developments in the area of early intervention and home-based visiting programmes, particularly with a shift towards psychotherapeutic interventions rather than behavioral approaches, it was felt to be prudent to carry out an updated review of the literature in this area, with a focus on high quality evidence (i.e. RCTs). It is worthy to note that three other complementary and related systematic reviews exist focusing upon parent –infant interaction interventions with infants at risk for social-emotional delays (Singleton, 2004), parent-infant psychotherapy for improving parental and infant mental health (Barlow et al, 2015) and early intervention programs for preterm infant and their parents (Benzies et al 2013). The authors however were interested in assessing the impact of home/community based intervention programmes that utilized a range of modalities, targeted a more heterogeneous population (not solely infants biologically at risk of developmental problems) and included only RCT studies.

This is extremely timely given the most recent publication by Robling et al (2015) who call into question the benefits of home –visitation programmes for first time teenage

mothers and the rejoinder commentary by Olds (2015) which calls for critical assessment by which results are integrated into the development of new interventions. The authors believe that this systematic review has a pivotal role to play in contributing to a robust early-intervention evidence base.

The aim of this systematic review is therefore to both up-date the current evidence base (the review by Bakermans-Kranenburg et al., 2003) and to provide a contemporary assessment of the effectiveness of home-based visiting interventions in enhancing parental sensitivity and attachment security. It is anticipated that this systematic review will make a contribution to the understanding of how etiological factors may moderate child and family health outcomes and reduce the risk of developing attachment disorders in adult life. Therefore the key objective is to conduct a meta-analysis of RCTs of home-based visiting interventions.

## Methods

This meta-analysis reviewed published English language RCTs of home-based visiting interventions to quantify their effect on attachment security and parental sensitivity compared with treatment as usual. RCTs were selected as they are considered the gold standard in primary research. Whilst we are aware of that there is a raft of study designs, we restricted this review to RCTs because we were interested in quantifying the effectiveness of the intervention, and RCTs are the most reliable way of doing this (Sackett & Rosenberg, 1995; Evans, 2003; Petticrew & Roberts, 2003).

### *Search Methods*

Studies were identified by searching the following electronic databases: Medline, PyschInfo and AMED. The search was limited to English language due to limited resources in translating articles. The search was conducted from 2002 to March 2015 (commenced at the date by which Bakermans-Kranenburg et al's (2003) search was completed). Articles were only included which were complete and published.

The following search terms were used; "early" or "parent" or "family" **and** "intervention" or "training", **and**, "attachment" or "sensitivity". (See App 1 for full electronic search strategy for one major database). In addition Reference lists from the papers identified through the electronic search were hand searched. Where appropriate, authors were contacted to gather more information/data.

INSERT TABLE 1 ABOUT HERE

#### *Data Extraction*

Two reviewers (one of whom was the author **HT**) independently extracted data from each paper using a standardized form adapted from the template devised by the Cochrane Consumers and Communication Review Group. The data were entered into REVMAN (Reviewer Manager 5, 2012, [tech.cochrane.org/revman](http://tech.cochrane.org/revman)). The data extraction form was piloted before use on a 25% sample by one reviewer. For each study, data were extracted on participant characteristics including: number of participants, maternal age, infant gender, infant age, ethnicity, marital status and child protection status. In relation to study characteristics, information on the intervention and control intervention were collected, including: type, setting, frequency and duration of intervention, mean number of sessions, follow up and details of those who were responsible for delivering the intervention as well

as the primary and secondary outcomes. Data were extracted on study design, including the recruitment method, number of participants recruited to each group, method of randomization, inclusion and exclusion criteria, statistical methods and analysis. Outcome data were collected on the number of participants in the control and intervention group and also the numbers in relation to the outcomes of interest, i.e. sensitivity and/or attachment.

#### *Assessment of risk of bias*

All studies were independently assessed for risk of bias using the 'Suggested risk of bias criteria for EPOC reviews' as developed by the Cochrane Effective Practice and Organisation of Care Group (EPOC, 2013) by two reviewers, one of whom was one of the authors (HT). Bias was assessed in relation to the following areas: Random sequence generation; Allocation concealment; Blinding; Blinding of participants and personnel; Blinding of outcome assessment; Incomplete outcome data; Selective reporting; Other bias. Reviewers assessed all domains as being high, low or unclear (uncertain).

#### *Data analysis*

*Measures of treatment effect.* The data collected were analyzed using Review Manager 5.2 (Tech.cochrane.org/Revman). For dichotomous data, the number of participants per category was collected and the odds ratio calculated (with 95% CIs) (Deeks et al., 2011). For continuous data, the mean value, the standard deviation and the number of participants in each group was collected in order to calculate the standardized mean difference (with 95% CIs) (Higgins & Deeks, 2011).

*Assessment of heterogeneity.* Heterogeneity was assessed using Chi<sup>2</sup> tests (with statistical significance at p value of 0.1), and the I<sup>2</sup> statistic. Heterogeneity increases as I<sup>2</sup>

increases and we interpreted an  $I^2 \geq 50\%$  as evidence of substantial heterogeneity.  $I^2$  is a useful measure of how heterogeneous studies are, as this statistical calculation is not dependent on the number of studies included, or the sample sizes (Deeks et al., 2011). Where studies were not found to be heterogeneous results were pooled.

### *Data synthesis*

Where appropriate, dichotomous data were pooled using the Mantel-Haenzel odds ratio method. This method of statistical analysis was used because the number of studies and participants was low, as well as the treatment effect being small and this method has been shown to have better statistical properties when there are few events (Deeks et al, 2011).

One study (Cooper et al, 2009) was carried out in South Africa whereas the remaining studies (Bernard et al, 2012; Niccols, 2008; Sadler et al, 2013) were set in America and Canada. The three North American & Canadian studies were grouped together and considered separately to the South African study (Cooper et al, 2009) due to differences in populations.

Within the North American and Canadian studies (Bernard et al, 2012; Niccols, 2008; Sadler et al, 2013), Sadler et al (2013) conducted a longer term study with the intervention being delivered over 2 years whereas the remaining two studies (Bernard et al, 2012; Niccols, 2008) implemented shorter term interventions; these were therefore considered separately within this group.

It is important to clarify that Burnard et al (2012) enrolled children to the study when they were between 1.7 and 21.4 months – therefore participants presented with a wide range of ages and some may have been eligible for attachment classification 3 months into the intervention programme, but some may not have been depending on the age they were enrolled. Therefore in the resulting forest plots, 3 and 12 months refer specifically to the time point the attachment classification was assessed post intervention and not the child's age. Attachment classifications cannot be assessed until the child is 12 months of age; however behaviours observed may be indicative of developing attachment patterns being laid down in the first year of life (Beebe et al, 2010).

## Results

### *Description of Studies*

The study characteristics and findings are summarized in Table 2. A total of 71 studies was identified, of which 12 were duplicates. Of the 58 remaining studies, 47 were excluded as they failed to meet the inclusion criteria. Of these 47, 30 were not randomized controlled trials, four did not consider the population of interest, four did not deliver an appropriate intervention and nine did not collect the desired outcomes; this left a remaining 11 studies for full text screening.

INSERT TABLE 2 HERE

Seven of the remaining 11 studies did not meet the inclusion criteria; on further investigation, five studies were found not to be randomized controlled trials, one study did not assess the prerequisite outcomes and the remaining study was excluded due to the infant age exceeding 36 months. This left a total of four studies which met inclusion criteria

and were included in this systematic review. Three of these studies contained extractable data for further analysis and meta-synthesis. See Figure 1 for flow diagram of study selection.

INSERT FIGURE 1 ABOUT HERE

### *Study Characteristics*

The four studies identified as appropriate for inclusion in this meta-analysis were all (RCTs) which were published in the English language. Two of the studies were conducted in North America (Sadler et al., 2013; Bernard et al., 2012), one in Canada (Niccols, 2008) and one in South Africa (Cooper et al., 2009).

### *Study Participants*

The four studies had a grand total of 743 participants; the number of study participants ranged from 76 to 449, with a mean number of 185.8. All participating parents were female excepting in Bernard et al. study (2012) which included 2 males. The mean age of parents ranged from 19.6 to 28.8 years with an average mean age of 25.67 yrs. Only Sadler (2013) provided detailed information on infant and maternal characteristics within the study population to include: ethnicity and gender and also wider associated circumstances such as gestational age, infant birth weight and obstetric intervention. However, all studies make some reference to socio-demographic characteristics of the study population and any additional risk or concentrated disadvantages such as low socio-economic status, single parent status, educational attainment, maternal stress and safeguarding issues.



### *Study Interventions*

The types of interventions included in these studies varied. Not all were attachment based (e.g. parent education). The approaches and interventions can be subdivided into those that were sensitivity based (aimed at increasing synchronized behaviors congruent with an infant's needs), representationally based (aimed at encouraging the parent to understand, review and reevaluate their own childhood experiences) and attachment based (focus on developing attachment relationships).

The length of the intervention ranged from 2 – 27 months, with an average length of 9.1 months. The length of follow up ranged from 0 to 18 months with an average length of 6.3 months. Two of the four programs (Sadler, 2013; Niccols, 2008) were delivered by expert professionals. The remaining two were delivered by parent trainers (Bernard, 2012) and mothers recruited from a local community council (Cooper, 2009). All interventions were manualized with the majority being home visiting based with only one program delivered as a community group intervention (Niccols, 2008). Three studies (Cooper et al, 2009; Niccols, 2008; Sadler et al, 2013) used control interventions which were treatment as usual, with two of these (Niccols, 2008; Sadler et al, 2013) being home visiting as per local policy and one (Cooper et al, 2009) receiving the normal service provided by their local infant clinic. Similar to this, one study (Bernard et al, 2012) used a control intervention adapted from a home visitation component of a programme developed by Ramey, McGinness, Cross, Collier and Barrie-Blackley (1982) called the Developmental Education for Families sessions.

### *Study outcomes*

One study (Bernard et al., 2012) reported on the outcome of attachment only and three studies (Cooper et al., 2009; Niccols, 2008; Sadler et al., 2013) reported on the outcomes of both attachment and sensitivity. In relation to attachment, three studies contained extractable dichotomous data (Bernard et al., 2012; Cooper et al., 2009; Sadler et al., 2013) where the number of participants classified as secure attachments, or disorganized attachments was stated. In relation to sensitivity, Cooper et al. (2009) reported continuous data on the outcome of sensitivity with the mean and standard deviation stated.

#### *Study bias*

The studies included were considered to be at an overall low risk of bias. All studies reported the use of randomization with only Bernard et al. (2012) omitting to state the specific method of random sequence generation used. All studies were assessed as low risk of bias in relation to allocation concealment. Blinding of participants and key personnel can be hard to achieve in non-drug interventions and all of the trials were classified as having a high risk of bias for this methodological feature. All studies declared that blinding occurred at outcome assessment which decreases the likelihood of performance bias (Pannucci and Wilkins, 2010). Sadler et al (2013) identified that participants often disclosed their allocation but failed to identify when this occurred, which introduce performance/detection bias (Pannucci and Wilkins, 2010). All studies were rated low on bias resulting from incomplete outcome data (due to attrition). All studies were rated low on other forms of bias including representativeness of study population to general populations.

### *Primary Outcomes: Infant attachment*

*South African study.* Cooper et al (2009) found higher rates of secure attachment (74%) in the intervention group than in the control group (63%) at 12 months and this was statistically significant (OR=1.71; p=0.03) – see figure 2. This suggests that there is a positive association between the intervention and attachment classification in this study. A discrepancy however was identified in the reporting of when these data were collected with inconsistencies between tabular and textual data. It is therefore unclear if these data were collected at 12 or 18 months.

*Insert Figure 2 here*

*North American & Canadian Studies.* Bernard et al (2012) found that those receiving the intervention showed higher rates of secure attachment at 3 months compared with the control group (OR=2.14, 95% CI=1.02-4.47; p=0.04) – see figure 3.

This suggests that those in the intervention group are more likely to have a secure attachment than those in the control group. Whereas Niccols (2008) reported small positive improvements in attachment at 6 months. However, these were not found to be statistically significant at post-test and follow up. This indicates that in this study, there is no difference in infant attachment between the intervention and control group. Niccols (2008) did not report any extractable data for further analysis. Similarly, Sadler et al (2013) found higher rates of secure attachment in the 'Minding the Baby<sup>®</sup>' group (64.4%) than the control group (48.8%). However these results were not found to be statistically significant (OR=0.29, 95% CI=0.67-4.51; p=0.26) – see figure 3. The forest plot in figure 3 clearly shows that for

this study the 95% confidence interval crosses the line of no effect which suggests that these results could be a result of chance rather than an effect of the intervention.

*INSERT FIGURE 3 ABOUT HERE*

When the extractable data from both North American studies was pooled (despite data being collected at differing time points), the overall effect was positive in favor of the intervention (OR=1.98, 95% CI=1.10-3.55;  $p=0.02$ ). This suggests that overall, those receiving an early intervention, are more likely to have a secure attachment than those allocated to the control group. These studies were not found to be heterogeneous ( $\text{Chi}^2=0.12$ ,  $p=0.73$  and  $I^2=0\%$ ).

#### *Disorganized Attachment*

*South African Study – Cooper et al. (2009).* The South African study found slightly lower rates of disorganized attachment in the intervention group than in the control group, however, this was not found to be statistically significant (OR=0.63, 95% CI=0.27-1.42;  $p=0.26$ ). This is demonstrated in figure 4 where it is clear that the 95% confidence interval crosses the line of no effect. This indicates that the outcome of disorganized attachment could be a result of chance rather than the effect of having received or not received an early intervention.

*INSERT FIGURE 4 HERE*

*North American & Canadian Studies.* Bernard et al (2012) reported lower rates of disorganized attachment at 3 months compared with the control group (OR=0.35, 95% CI=

0.17-0.75;  $p=0.006$ ). This suggests that those in the intervention group were less likely to develop a disorganized attachment than those in the control group. See figure 5.

Sadler et al (2013) reported lower rates of disorganized attachment in the Minding the Baby® group (27%) than in the control group (43%); however these results were not statistically significant ( $OR=0.45$ ;  $p=0.15$ ). This is demonstrated in figure 5 where the 95% confidence interval crosses the line of no effect. This suggests that there is no correlation between the intervention and disorganized attachment.

INSERT FIGURE 5 HERE

When the data from both North American studies were pooled (despite the data being collected at differing time points), there were lower rates of disorganized attachment in the intervention group compared with the control ( $OR=0.39$ , 95%  $CI=0.22-0.72$ ;  $p=0.002$ ). See Figure 5. This indicates that those receiving an early intervention have lower rates of disorganized attachment than those in the control group. These studies were not found to be heterogeneous ( $Chi^2=0.23$ ,  $p=0.63$  and  $I^2=0\%$ ).

*Pooled Results for Secure Attachment – All studies.* When the data for secure attachment were pooled for the South African and North American Studies those in the intervention group were more likely to have a secure attachment than those in the control group ( $OR=1.81$ , 95%  $CI=1.25-2.62$ ;  $p=0.002$ ) (see figure 6). Accepting population differences, these studies were not found to be heterogeneous ( $Chi^2=0.26$ ,  $p=0.88$  and  $I^2=0\%$ ).

INSERT FIGURE 6 HERE

*Pooled Results for Disorganized Attachment – All studies.* Similarly, when disorganized attachment data were pooled for both the South African and North American Studies, those in the intervention group were less likely to have a disorganized attachment than those in the control group (OR=0.46, 95%CI=0.29-0.75; p=0.0002). These studies were again not found to be heterogeneous ( $\text{Chi}^2=1.01$ ,  $p=0.60$  and  $I^2=0\%$ ) (see figure 7).

INSERT FIGURE 7 HERE

### *Sensitivity*

*South African Study – Cooper et al. (2009).* Cooper et al (2009) assessed sensitivity at 6 and 12 months; at each time point, those in the intervention group had higher rates of sensitivity than those in the control group (at 6 months: IV=0.24, 95% CI=0.01-0.46, p=0.04; at 12 months: IV= 0.24, 95% CI=0.03-0.48, p= 0.03) (see figure 8).

INSERT FIGURE 8 HERE

*North American & Canadian Studies.* Niccols (2008) assessed maternal sensitivity and reported small positive effect sizes which were not found to be statistically significant. Niccols did not report any extractable data for further analysis.

### Discussion

Overall, this meta-analysis has demonstrated that early interventions are effective in improving infant attachment security and maternal sensitivity. It is difficult to judge the degree of consistency between this review and previous reviews, owing to the fact that intervention programs varied in design, length, setting, implementation and sample size and characteristics, therefore any conclusions drawn should be treated with a degree of caution,

but also none disaggregated the effects for different intervention components. This in turn also makes it difficult to determine which are the most effective intervention components and/or mediating factors (e.g. parental reflective functioning).

#### *Impact on Attachment outcomes*

In relation to the outcome of attachment, the South African study (Cooper et al., 2009) found higher rates of secure attachment in the intervention group than the control group, but failed to find lower rates of disorganized attachment in the intervention group compared with the control group. This suggests that the early intervention was successful at improving attachment security but failed to decrease rates of disorganized attachment. Cooper et al. (2009) report that more than 10% of those receiving an early intervention were classified as securely attached, which has been significantly associated with a range of positive social and emotional outcomes throughout childhood (Schoore and Schoore, 2008). The results also showed that those receiving the intervention had higher rates of maternal sensitivity than those in the control group which indicates that early interventions are effective in promoting maternal sensitivity as well as attachment security. These findings concerning impact on secure attachment are consistent with results reported by previous studies (Slade, 2005; Weinfield, Sroufe, Egeland, & Carlson 2008). Although cognisance needs to be taken of the cross-cultural differences and differences in demographic characteristics, it is encouraging that the magnitude of Cooper et al.'s (2009) results is the magnitude of their results is similar to those of more developed countries such as the United Kingdom and this indicates that there are some similarities in the effects of early

interventions in relation differing populations in improving attachment security and sensitivity.

In the North American and Canadian studies, one RCT (Bernard et al., 2012) in line with the previous review by Bakermans-Kranenburg et al. (2003) found that early interventions increased rates of secure attachment. The two remaining studies (Niccols, 2008; Sadler et al., 2013) found that the interventions improved rates of secure attachment; although these results were not statistically significant. When the data were pooled for meta-analysis, those in the intervention group demonstrated higher rates of secure attachment than in the control group which supports the notion that early interventions are beneficial in improving attachment security.

#### *Impact on Disorganized Attachment*

Only one RCT from the North American and Canadian group (Bernard et al, 2012) found that the intervention decreased rates of disorganized attachment compared with the control group. The two remaining studies (Niccols, 2008; Sadler et al, 2013) failed to find statistically significant results in relation to disorganized attachment. However, again, when the data from all three studies were combined for analysis, the overall effect of the intervention was found to decrease rates of disorganized attachment in the intervention group, compared with the control group. These findings further evidence that early interventions are effective in decreasing rates of disorganized attachment. Although only one individual study (Bernard et al., 2012) found positive results for the outcomes of secure and disorganized attachment, when the data from all three studies were pooled (Bernard et al., 2012; Niccols, 2008; Sadler et al., 2013) the results were found to be positive in favor of



early interventions. It is common in this type of research where studies are small and have low power, resulting in a statistically non-significant result being interpreted to mean that no treatment effect exists, i.e. type II error (Sheldon, 2000). Individually, the studies may have had insufficient power to detect the treatment effect, but when the data were combined, a positive treatment effect was found. However, it should be noted that none of the studies had a primary aim of addressing disorganized attachment through the home-based intervention.

One study (Bernard et al., 2012) focused the intervention on reducing frightening behaviour because parents who have been maltreated or who have experienced trauma often behave in frightening ways towards their children, which has been found to be associated with disorganized attachment. This intervention was a manualised programme, focusing on parenting behaviour, with the parent and child together in order to observe interactions, offer immediate feedback as well as positive reinforcement. Whilst not the sole effective component, modification of parental behavior may need to be an integral component within home-based visiting intervention programs in order to foster positive, synchronous behaviors congruent with an infant's needs and reflective of good parenting.

Overall, the results across the individual studies indicate that attachment security is easier to affect than disorganized attachment. Previous research in this area has found that disorganized attachment styles are linked to internalizing and externalizing behavior disorders (Lyons-Ruth & Melnick, 2004; Niccols, 2008). Lyons-Ruth and Jacobvitz (1999) concluded that attachment disorganization may result not only from a frightening or frightened parent but also from an extremely insensitive or neglecting parent. Therefore

interventions aimed at enhancing maternal sensitivity may result in more secure infant attachment and reduce attachment disorganization, without having to solely target infant attachment.

Not all complex social problems can be addressed through a standardized family intervention programme, especially when aimed at parental functioning (Munro, 2011). Early reviews have found that home visiting is most effective when particular sub-groups or communities who are considered to be at risk of adverse outcome are targeted (Bull et al., 2004). However we need to acknowledge, the increased difficulty in affecting disorganized attachment styles in families who present with a number of complex problems and comorbidities. Those who are at high risk, have histories of abuse, neglect, complex trauma and/or face adversity often fare worse than other populations (Bakermans-Kranenburg et al., 2003; Nievar et al., 2010). This is because such families may be emotionally and physically inaccessible, prone to disengagement, dysregulation and impulsivity and therefore less likely to successfully engage with early interventions (Nievar et al., 2010) and therefore not amenable to interventions focused on improved attachment, reduced levels of disorganized attachment and enhanced maternal sensitivity; this is known as the Mathew effect (Merton, 1968). Karen (1994), reports that in families living in unstable home environments, neglect or abuse is more common, as are the numbers of insecure children. Generally, this suggests that those who are most in need of support from home visiting, are least likely to access and engage with it. A major extraneous variable in the effectiveness of interventions is engagement: efficacy of interventions relies on the relationship between service user and practitioners as well as continued access and engagement. Certain practices that can be included in some programmes, such as safeguarding risk analysis and

reporting has the potential to seriously damage the opportunity for engagement and relationship based work with subsequent impact on the take up and completion of the programme offered. This rekindles the debate about whether intervention programs should only be deployed after a careful assessment of the family and targeted to those in the higher need groups who would be responsive to the intervention and gain maximum benefit.

### *Maternal Sensitivity*

In the North American & Canadian group, only one paper reported on the outcome of maternal sensitivity (Niccols, 2008); this study did not find statistically significant results between the intervention and control groups for the outcome of maternal sensitivity. Niccols (2008) reported that changes in maternal sensitivity were larger in the intervention group than the control group when this was measured using the HOME Responsivity scale; sensitivity was more found to be more receptive to change when this outcome was used rather than the maternal behaviour Q-sort. The sample size in this study was small which could indicate insufficient power to detect a statistically significant result, (Sheldon, 2000) and the authors reported differing compliance between the intervention and control which could also impact the results. Study results mirror those of Bakermans-Kranenburg et al., 2003 which found that early interventions were effective in enhancing maternal sensitivity.

Bakermans-Kranenburg et al. (2003), report that interventions with a clear focus on maternal sensitivity were successful in achieving parallel improvements in parental sensitivity and attachment security. Similarly, (Guttenteg et al., 2014) found interventions

which included a focus on the parent-child relationship demonstrated more promising results than interventions simply providing child healthcare or other community support. This supports the crucial role of relationship-based clinical interventions with the potential to impact on both attachment and sensitivity outcomes.

Bakermans-Kranenburg et al. (2003) found that when interventions were successful in improving maternal sensitivity, there was also a positive change in infant attachment security; this could be due to a shift in the mother's reflective functioning. Studies which have assessed maternal reflective functioning have shown that mothers, who are able to use reflective functioning (i.e. envisage their own mental states, those close to them and their baby), are more likely to respond to their babies sensitively and have improved rates of attachment (Sadler et al., 2013). The intervention in this study, *Minding the Baby*<sup>®</sup>, takes a psychodynamic home-visiting approach and suggests that if a mother can understand her internal working model, process and understand her own thoughts, feelings and responses, then she is more likely to be able to reflect on her relationship with the world, others and her baby and therefore respond more sensitively.

### *Types of Interventions*

As already noted, interventions were varied, being multimodal and multilevel and targeted not only at parenting practices but also at enhanced parental sensitivity and infant attachment. Sadler et al. (2013) implemented the '*Minding the Baby*<sup>®</sup>' program which is an intensive, interdisciplinary home-based visiting programme intervention delivered by nurses and social workers, utilizing a mentalizing and reflective functioning based approach. Niccols (2008) utilized a group work approach including small group work, large group

discussion, homework and peer support. We contend that group based interventions may bring a number of key benefits that could be lacking from individual based interventions such as the opportunity for networking with others, therapeutic group processes and fostering parental capability and capacity. Group work can also have greater economic benefits than individual based interventions. However, groups require careful and sensitive facilitation to ensure all participants access and benefit from them equitably. It has to be acknowledged that some very young first time parents may lack confidence and the necessary social skills to equip them in group based interventions.

The South African study (Cooper et al., 2009) implemented an adaptation of a 'The Social Baby' manualized home visiting programme which aims to improve parents' understanding babies' communication. In this study, the intervention was delivered by women from the local community rather than expert professionals, who offered training in the intervention prior to the intervention commencing. Given the voluntary nature of research programs such as these along with the cohort characteristics there is a significant risk of non-engagement and attrition with subsequent loss to follow-up.

Interventions which have included a focus on the parent-child relationship have shown promising results, rather than those simply providing child healthcare or other community support (Guttentag et al., 2014; Bakermans-Kranenburg et al., 2003). However, the differing types of interventions in the included studies here have highlighted the difficulties in evaluating early interventions, due to them being so varied and diverse (Bull et al., 2004). The results of this review are consistent with other research in the area of attachment and sensitivity, but it would be beneficial to identify if a particular type/focus of

intervention is more effective for particular families than others. Similarly a one approach fits all is unlikely to lead to sustained change in all families all of the time. Therefore it may merit evaluation of the effectiveness of interventions in families at different key junctures.

#### *Impact of visit dosage and program duration*

The study by Bernard et al. (2012) demonstrated the most positive and consistent results out of the included studies where the intervention was short term, intensively scheduled and delivered over a duration of 10 weeks. This is in keeping with existing evidence which has found that the most effective interventions did not use a large number of sessions, but in fact, fewer contacts were found to be more effective (Bakermans-Kranenburg et al., 2003; Guttentag et al., 2014). However the evidence with respect to dosage and intensity is divergent. Other studies (Nievar et al., 2010) found intensive interventions were most effective, with more than three visits per month, similarly, MacLeod & Nelson (2000) found large effect sizes in interventions lasting six months or longer in duration, but which provided more than 12 home visits, i.e. intensive support. Intensive support better facilitates engagement, with consistency, positive reinforcement and guidance more readily available to families during the course of the intervention. The differing results in relation to the duration of the intervention could be attributed to higher attrition rates in shorter term interventions (Bakermans-Kranenburg et al., 2003). Attrition rates can be impacted due to the chaotic lives of the families involved, the voluntary nature of the research program and/or a mismatch between perceived need and the services offered as part of the intervention program. This subsequently results in non-attendance of appointments, non-access, false compliance. Attrition rates could also be impacted due to

those in the control group not receiving a comparable level of support (Bakermans-Kranenburg et al., 2003); a possible solution to this problem has been to offer those in the control group a 'dummy intervention', rather than treatment as usual, with only one or two small differences between the control and intervention groups (Bakermans-Kranenburg et al., 2003). The findings of this review are consistent with existing evidence in that intensive interventions yield the most positive results, however there is still divided opinion regarding optimum visit dosage and program duration. We would like to highlight that only studies by Cooper et al., (2008) and Sadler et al. (2013) commenced interventions prenatally: time of commencement is a significant factor when considering impacts of duration and visit dosage of programs. Pregnancy is an ideal time for interventions to commence when the family feels most vulnerable and prospective parents are emotionally and biologically open to the possibility of new ways of thinking and acting and accepting of support (Mayes, Swain and Leckman, 2005). Encouraging parents pre-birth and working with parent infant relationships from birth offers opportunities to improve a range of maternal and infant health outcomes.

Frequency of visitation was difficult to assess as some studies (Niccols, 2008; Bernard et al., 2012) failed to report visit dose or to compare this against fidelity targets. In addition it must be remembered that scheduled visits do not necessarily equate with family access or engagement.

#### *Length of follow-up*

Length of follow-up ranged from 0 to 18 months across the studies with a mean of 9.1 months. It is important to examine the longitudinal effects of these types of home based intervention studies. Bernard et al. (2012) report that reducing rates of insecure and

disorganized attachment could lower psychopathology and deviant behaviour in later childhood and adolescence. The studies included in this review may not have offered sufficient time for changes in maternal sensitivity and attachment security to be detected, i.e. a sleeper effect. Whereas longer term follow up studies would provide further information on sleeper effects and/or whether early interventions have permanent/long-lasting effects (Bakerman-Kranenburg et al., 2003). This is important information for policy makers when considering the economic benefits/impacts of interventions. A follow-up study (Ordway et al., 2014) to Sadler et al. (2013) examined the intermediate effects (1 to 3 years post intervention) of Sadler's parenting home visiting program with regard to child behaviors and parental reflective functioning. Mothers who participated in the Minding The Baby® intervention reported their children as having significantly fewer externalizing behaviors following the interventions.

#### *Delivery of Intervention*

A number of key questions have emerged out of this review in respect to whether interventions can be just as effectively delivered by less expensive para professionals rather than expert highly trained practitioners. In the studies included in this review, there appeared to be no difference in whether the interventions were delivered by professionals or non-professionals. However, other researchers including Olds et al. (2002) have established that non-professionals improved mother-child interactions with only half the effect size of when nurses delivered the service; however, there were key differences between the study outcomes and levels of supervision offered throughout this study which may have impacted these findings. This is in keeping with results from other studies with a



meta-analysis by Brooten et al. (2003) which concluded that a greater dose of advanced practice nursing services was associated with better patient outcomes as well as decreased health-care costs. Drawing upon one of the author's (GM) current experiences within a NSPCC funded international research project, the complexity of the work that is often involved in home visiting programmes necessitates the use of expert practitioners, often delivering complex interventions who in turn require intensive training and clinical supervision in order to acquire specific skills and developmental approaches for working with young mothers (Sanger et al., 2015). Questions still remain as to how best to meet the complex and substantial needs of populations of high risk young mothers and their children with frequent histories of complex trauma and adversity. Further economic evaluations of these interventions would help policy makers identify if it is worthwhile interventions being delivered by expensive professionals or para-professionals who are less expensive but who may yield smaller effect sizes in trials.

#### *Focus of the interventions*

All studies in this review included a focus on parent-child relationships targeting sensitivity and/or attachment/maternal representations. There are numerous other outcomes which would be beneficial to measure which are very significant to the health and wellbeing of children and young people, such as: immunization rates, child protection outcomes, parental mental health, educational achievement (Nievar et al., 2010). The outcome of maternal mental health can impact affect, alter attention, alter self-perception and also relationships with others (Sadler et al., 2013), although even in those with

depressive symptoms, studies have found improvements in parental sensitivity following early interventions, even when depressive symptoms did not reduce (Sadler et al., 2013).

### *Economic Evaluation*

Sometimes home based intervention programmes can have a large impact on a small minority of participants, which may be sufficient to make the programme effective across the whole wider group. The maximum cost of the Family Nurse Partnership in England, if all families remain in the programme for the maximum period of their entitlement , has been estimated at £7200 (at 2012 prices) (DoH, 2012) per family.

Unfortunately only one study included in this review sought to undertake a cost-benefit analysis, assessing the economic benefits of the early intervention delivered. Niccols (2008) reports that the early group based intervention cost half the amount of the treatment as usual home visiting intervention (Niccols, 2008). This was a group intervention and these results are therefore to be expected, with the intervention being delivered to a large number of participants using fewer resources. The cross translation of interventions from other countries such as North America and Canada into a UK context is poorly understood and these are rarely piloted. This perhaps could be due to interventions being costly, with frequent changes in government, rather than based on the needs of the population, despite RCTs incorporating multi-methods/designs providing the best evidence. The Minding the Baby®(Sadler et al., 2013) is an example of a pioneering program whereby a well-researched home visiting intervention program is being translated into the UK context as part of an ambitious multi-site NSPCC sponsored RCT (Longhi et al, 2016). To date indications are that the programme is successfully engaging families in effective working

relationships with professionals effecting long term positive growth and change (Sanger et al., 2015).

### *Strengths and weaknesses of included studies*

We acknowledge that the quality of a systematic review is only as good as the quality of the studies included within it (Bornhoft et al., 2006; Dekkers et al., 2009; Kenrick et al., 2013). Therefore the authors took steps to rigorously assess the quality of studies in order to detect any bias which could impact the validity of a review. Studies included in this review were deemed to be at an overall low risk of bias. However it is worth highlighting that Sadler et al. (2013) identified that participants often disclosed their allocation, which could have introduced performance/detection bias (Pannucci and Wilkin, 2010) and therefore a false positive result or type I error.

The studies within this review included small sample sizes, with only two studies (Cooper et al., 2009 & Sadler et al., 2013) performing power calculations and hence increasing the likelihood of producing a false positive result. Individually, not all studies produced statistically significant results. Nevertheless, when the data were pooled for meta-analysis, the results were positive in favor of early interventions which offers promising initial evidence for continued support for these interventions in improving infant attachment security.

All studies included assessor rated outcome measures which improves the reliability of data collected. Three studies (Bernard et al., 2012; Cooper et al., 2009; Sadler et al., 2013) assessed attachment classifications using the Strange Situation Procedure developed by Ainsworth and colleagues (1978); this shows consistency in the outcome measures used

across these studies. Niccols (2008) assessed attachment using the Attachment Q Set outcome measure and sensitivity using the HOME and Maternal behaviour Q Set outcome measures; this was the only study to report on the outcome of sensitivity.

A further limitation in the use of outcome measures in the included studies is the participants' use of language. Those participants who are less well educated and/or who have experienced trauma and adversity might have significant difficulties in articulating their complex experiences (Sadler et al., 2013), and engaging with the prescribed interventions. This could result in attrition and loss to follow-up as well. Therefore meaningful results may not be identified by outcome assessors. This could have resulted in key relevant data being omitted from the individual studies, particularly in those studies that targeted 'high risk' families.

#### *Strengths and weaknesses of this systematic review & meta-analysis*

Generalizability of the findings from this review are limited in a number of ways. Despite the search strategy being systematic and comprehensive, relevant studies may have been omitted from this review as a result of restrictions on the search strategy. One example is that the search was restricted to include studies published in English language only and this could have introduced language bias into the review.

Also, the search strategy was conducted to identify studies addressing the primary outcomes of attachment and sensitivity; however, papers may not have been identified where these outcomes were reported as secondary outcomes, and therefore relevant papers may not have been identified in the search. Finally, studies were only included which

were complete and published accounts of RCTs. Our exclusion of this type of literature precluded a test of difference based on publication status.

The number of studies identified for inclusion in this review was small (four studies) and therefore the results should be interpreted and analyzed with caution. With only a few papers included in the review, the amount of data for use was limited. Due to restrictions on time and resources, the authors of included papers were not contacted to request further data for analysis. One paper (Niccols, 2008) failed to report any extractable data for analysis; only one paper reported data on sensitivity (Cooper et al., 2009) and three papers reported data on attachment (Bernard et al., 2012; Cooper et al., 2009; Sadler et al., 2013).

Heterogeneity was found to be low across all studies. Some differences between studies were obvious from the outset, such as the location of where the intervention was delivered, the population, the duration of the intervention and so on, and therefore the studies were divided into subgroups for analysis, before being pooled. Clinical heterogeneity is important across studies because with greater clinical heterogeneity, the more generalizable the results (Crowther & Cook, 2007). It is important that studies have clinical heterogeneity because differences in the results could be attributed to differences in study characteristics rather than the intervention delivered.

Heterogeneity was also considered across the results of the studies, i.e. statistical heterogeneity, and this was generally low. This is significant because if statistical heterogeneity is high, the weaker the inferences about the overall effect of the intervention (Crowther & Cook, 2007). The statistical heterogeneity could be improved with more studies and larger sample sizes for meta-analysis.

## CONCLUSIONS

The findings of this review in accordance with previous reviews (Bakermans-Kranenburg et al., 2003; Nievar, 2010) suggest that secure attachment, reduced rates of disorganized attachment and improved maternal sensitivity are made possible by early intervention programmes. Such interventions are also likely to lead to a range of social, developmental and health outcomes as well as the potential for increasing parental reflectiveness, capacity and efficacy. However, further research is warranted in relation to the efficacy of early interventions.

Although there were some inconsistencies across the individual studies included in this review and meta-analysis, when the data were combined, the results were positive in favor of early interventions improving both maternal sensitivity and attachment security, as well as reducing rates of disorganized attachment. However given that this review included a small number of studies, it would be inappropriate to use the findings of this review to recommend or influence policy changes. However the results are encouraging in relation to informing further research in this field.

Whilst it is difficult to isolate any one particular covariate in bringing about the outcomes, it is postulated that critical to all these intervention studies is relationship based working acting as a key agent of change. This is in accord with the UK Munro Review of Child Protection (2011) which emphasizes the criticality of professionals building purposeful relationships with children, parents and families. Professional who are able to establish positive working alliances will achieve better outcomes for children and their families.

### *Implications for Future research*

The type of early interventions included in this review and meta-analysis were broad in focus and therefore further research would be beneficial to clarify if there is a particular type of intervention that is more effective in improving rates of secure attachment, reducing rates of disorganized attachment and improving rates of maternal sensitivity than others. According to Guttentag et al. (2014), broad interventions have yielded mixed results. Therefore a profitable area of further research would focus on whether interventions should be targeted at particular populations (for example those involving children in need, where safeguarding concerns are known, or care leavers) and how engagement in these populations can be best facilitated. There is a stream of evidence also suggests that home visiting interventions that are restricted to a narrow range of outcomes, are often less effective than a more broad approach where multiple needs are addressed (Bull et al., 2004). Therefore it would be useful to explore other outcomes alongside attachment and sensitivity such as immunization rates, child abuse rates, parental mental health, educational achievement (Nievar et al., 2010), obstetric outcomes and rapid successive pregnancy rates (Sanger et al 2015) which are also very significant to the health and wellbeing of children and young people.

A recent published systematic review by Panter-Brick et al (2014) highlights how fathers are so marginal to the bulk of parenting intervention programmes and systematic evaluations of father engagement and their influence is stymied by the way such programmes are designed, studied and implemented. It follows therefore that future research on early intervention programmes will need to integrate ways of evaluating impact

and outcomes which may be moderated by gender and/or individual versus co-parenting status.

The cost effectiveness of early interventions was not evaluated in this study and this is vital before interventions are commissioned and implemented into policy and is becoming increasingly important with agencies and commissioners facing restricted budgets and fewer public services to offer vulnerable families support.

Further quality research is needed in the form of RCTs which minimize bias and therefore most reliably assess the efficacy of the interventions. These RCTs would need to identify a set of parental and infant primary outcomes that would facilitate comparisons between different studies and target populations to assess whether community/home based interventions are effective and have impact. We would also advise that more information is sought on which intervention components may be most effective and to whom they should be targeted, who is best placed to deliver the interventions and identification of key mediating factors on impact.

To conclude two prominent issues remain outstanding for future research in the field. Namely, the cost effectiveness of what can be complex intervention programs and targeted vs broad population based programs.

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## APPENDIX 1

Example search strategy:

1. parent\*.mp. or exp Parent-Child Relations/
2. parent\*.mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
3. carer\*.mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
4. mother\*.mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
5. father\*.mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
6. 1 or 2 or 3 or 4 or 5
7. (early adj3 parent adj3 intervention).mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
8. (family adj3 intervention).mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
9. (attachment adj3 intervention).mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
10. (parent\* adj3 training).mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
11. (family adj3 training).mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
12. 7 or 8 or 9 or 10 or 11
13. exp Reactive Attachment Disorder/nu, px, th [Nursing, Psychology, Therapy]
14. (attachment adj3 secur\*).mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
15. (parent\* adj3 sensitiv\*).mp. [mp=ab, hw, ti, sh, tn, ot, dm, mf, dv, kw, tc, id, tm]
16. 13 or 14 or 15
17. 6 and 12 and 16
18. limit 17 to (english language and humans and yr="2002 -Current" and english and humans and randomized controlled trial)



Table 1: Study Characteristics

PICOS Elements	Study Characteristics
Types of Participants	The participants of interest were mothers, fathers or carers of any age who received an early intervention before their child's age was 36 months, via 1:1 support, group work or guided self-help. No exclusions were applied in relation to the number of previous pregnancies.
Types of Intervention	The type of intervention was not restricted (particularly in respect of home visiting interventions as per the study carried out by Nievar et al, 2010) in order to maintain similar eligibility criteria to that of Bakermans-Kranenburg (2003) and to ensure the study was viable in contributing to the existing body of evidence. The interventions of interest were early interventions delivered before the child was 36 months of age. The follow up period of interest was 3 months, 6 months and 12 months.
Types of Outcomes Measures	The outcome measures of importance were the Ainsworth sensitivity rating scales, Home Observation for Measurement of the Environment (HOME) – specifically the Observation scale for maternal sensitivity, Nursing Child Assessment Teaching Scale (NCATS), the Erickson rating scales for maternal sensitivity and supportiveness,

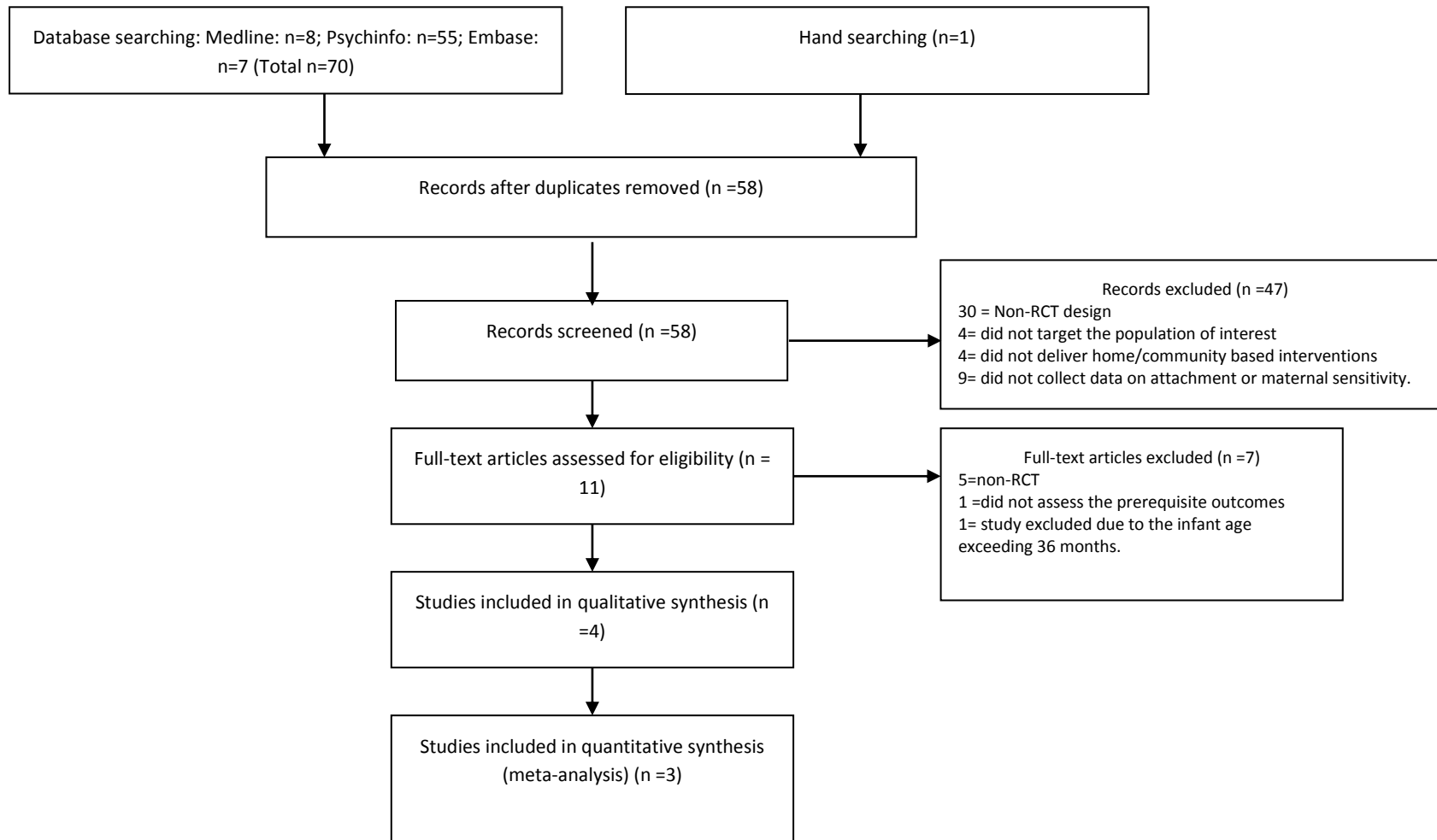
	<p>Ainsworth's Strange Situation procedure, as well as any other outcome measures identified as relevant to attachment and/or sensitivity. The effect measures of interest were the numbers of participants per category or odds ratios for dichotomous data, and for continuous data, the means and standard errors, in order to calculate the standardized mean difference (Higgins &amp; Deeks, 2011).</p>
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Table 2: Summary of included intervention studies

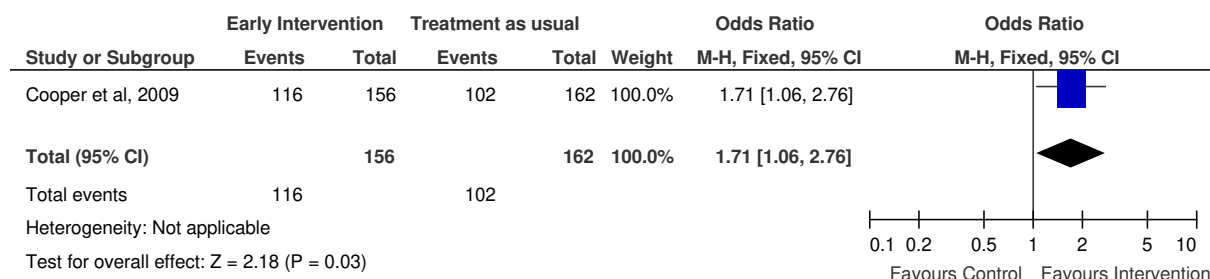
Study	Sample	N (parents)	Intervention	Frequency	Control	Outcome Measure	Attrition	Country
Bernard et al, 2012	Mothers were referred by agencies working with child protection services in a large mid-Atlantic city Mean age: 28.4	113	Attachment & Behavioral Catch-up. 10 week, weekly, home intervention. Parent trainers.	10 week, weekly, 1 month follow-up	Developmental Education for families. 10 week, weekly, home intervention. Parent trainers.	Attachment (Strange Situation)	Control:  Intervention:	USA
Cooper et al, 2009	Women in their last trimester of pregnancy. Mean age: 25.9	449	Social Baby. Varying frequency of intervention for 5 months, home intervention. Non-professionals.	Varying frequency of intervention for 5 months, 6, 12, and 18 month follow-up	Local infant clinic. Fortnightly visits.	Quality of mother-infant interactions (6 and 12 months) using Parent/caregiver involvement scale; and video material to measure maternal sensitivity and intrusive-coercive control respectively. Infant Attachment Security (18m) using the Strange Situation. Maternal Depression (Secondary Outcome) using DSM IV.		South Africa.
Niccols, 2008	Mothers eligible if able to complete a questionnaire in English and if they had not attended intervention previously Mean age: 28.8	76	Right from the Start. Community group intervention delivered by infant development specialists.	8 sessions weekly 6 month follow up	Treatment as usual. Professionals.	Infant Attachment Security (Primary Outcome) Attachment Q set. Maternal Sensitivity (Maternal Behavior Q-sort) and HOME Responsivity Scale		Canada.
Sadler et al, 2013	Primiparous women attending nurse-midwifery group prenatal care sessions Mean age: 19.6	105	Minding the Baby®. Varying frequency of intervention for 24 months, home intervention. Professionals.	Varying frequency of intervention for 27 months, No follow up*	Treatment as usual. Home visiting. Professionals.	Mother-infant interaction (AMBIANCE Scale)  Infant Attachment (Strange Situation) Maternal RF (Pregnancy Interview and PDI).		USA.

\* Whilst this study did not include a post program follow-up, a range of maternal and infant health measures/outcomes were administered as an integral part of the intervention at 12 and 24 months.

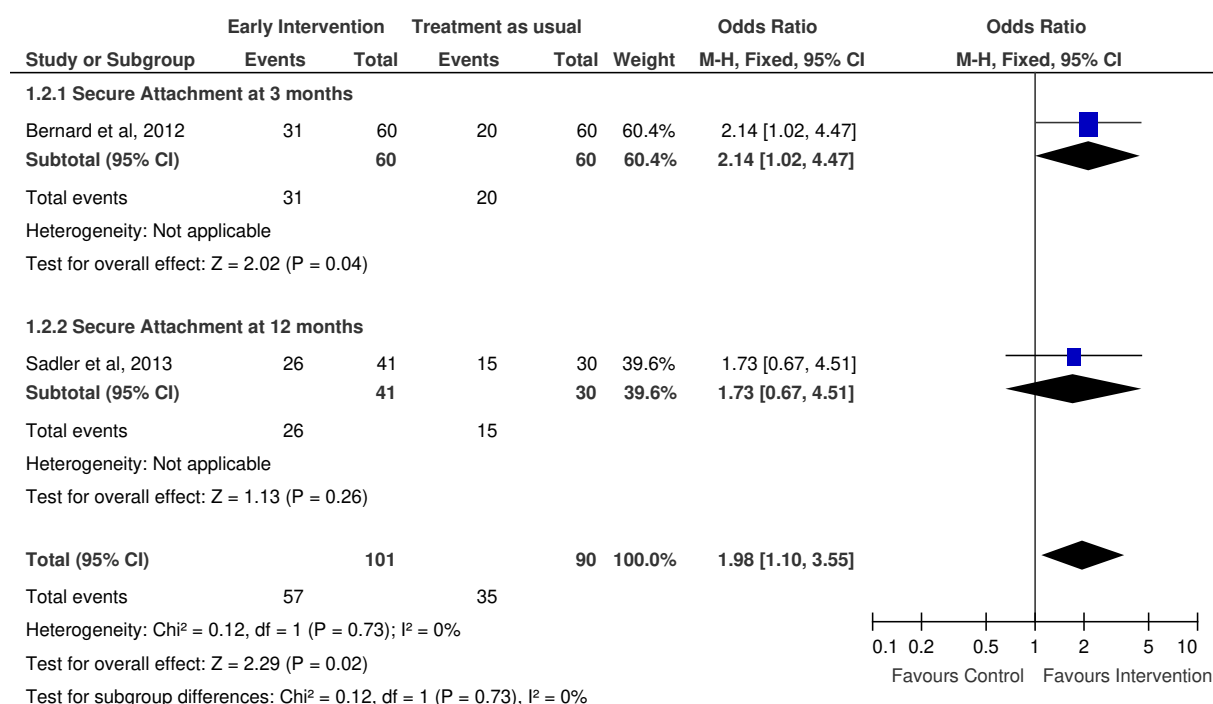
figure 1: Flow diagram of study selection



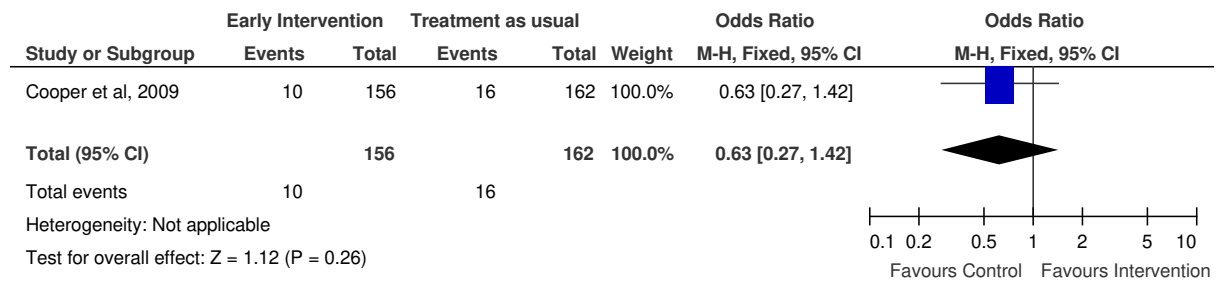
**Figure 2. Secure Attachment at 12 months – South African Study**



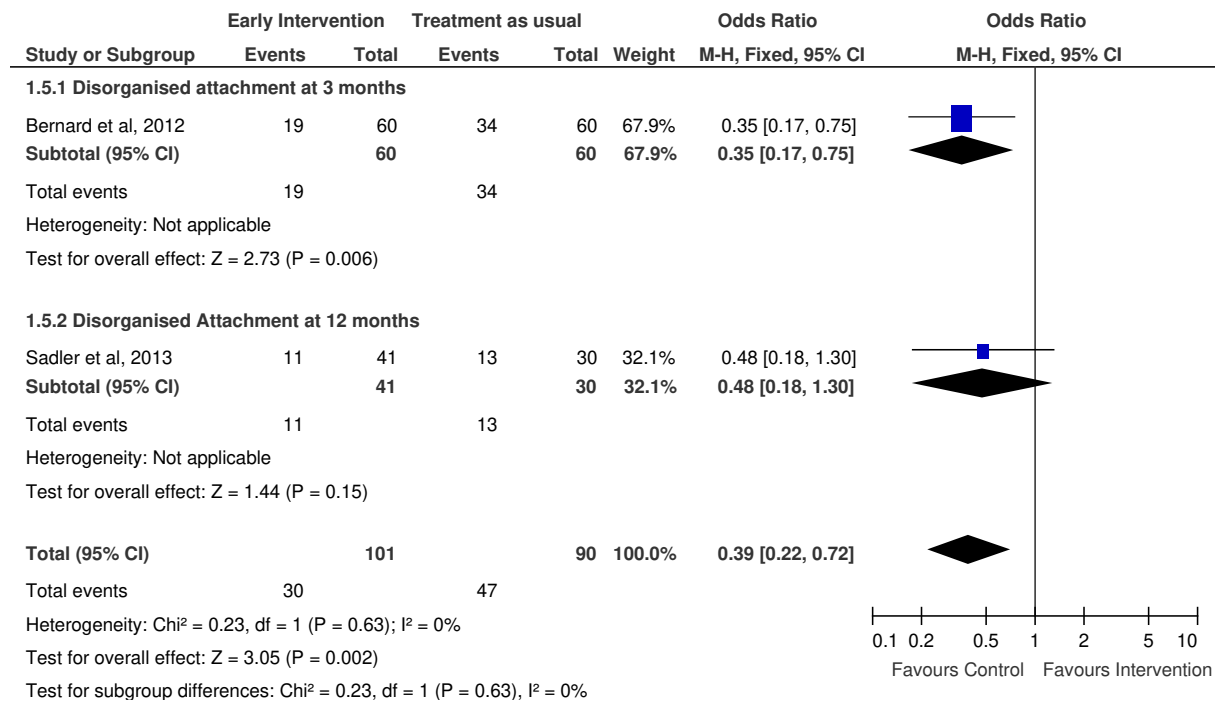
**Figure 3. Secure Attachment in North American Group at 3 and 12 months post intervention**



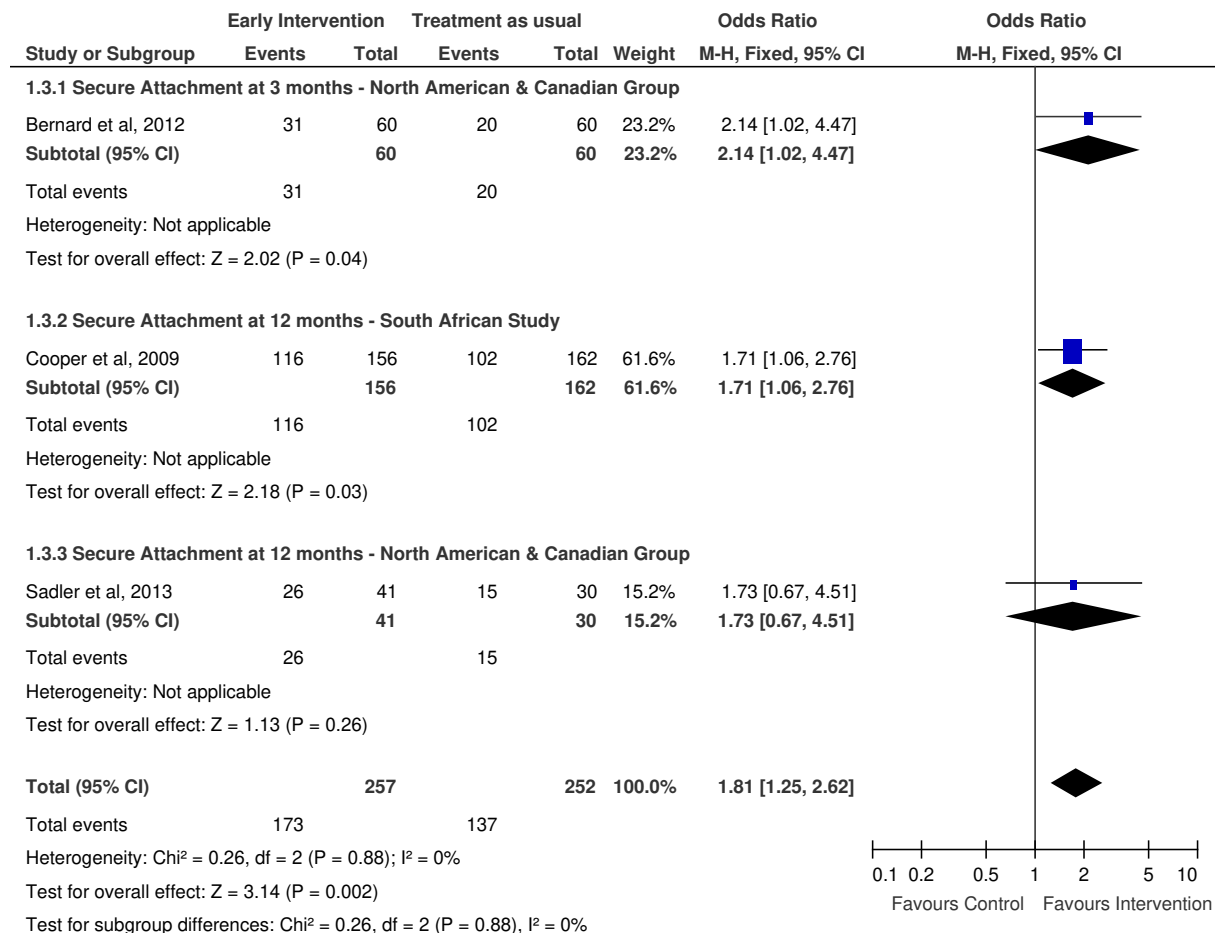
**Figure 4.** Disorganized Attachment at 12 months – South African Study



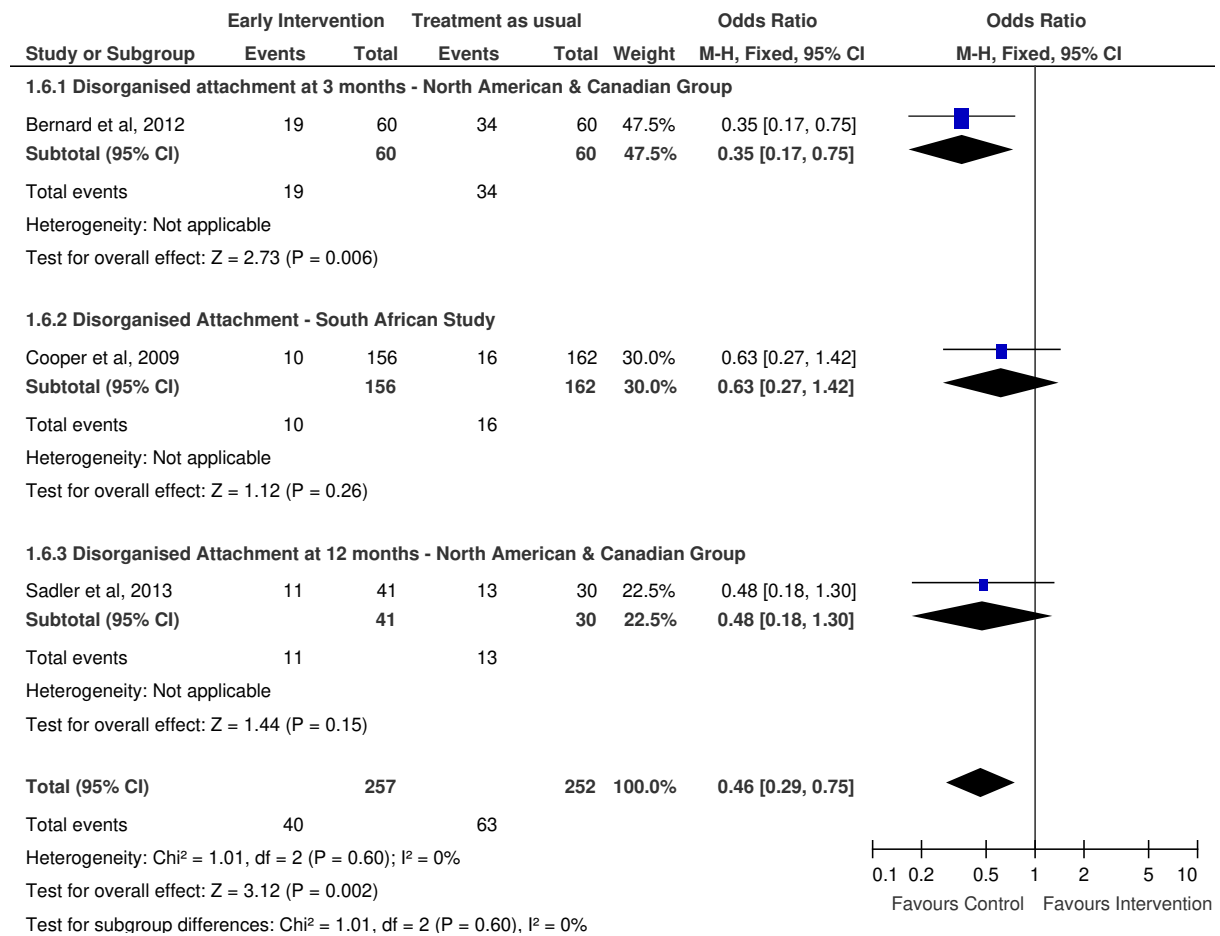
**Figure 5.** Disorganized Attachment in North American Studies at 3 and 12 months post intervention



**Figure 6. Secure Attachment in all groups**



**Figure 7. Disorganized Attachment in all groups**



**Figure 8. Sensitivity in the South African Study**

