STUDY PROTOCOL

REVISED Barriers and enablers to Caregivers Responsive feeding Behaviour (CRiB): A mixed method systematic review protocol [version 2; peer review: 2 approved]

Vicki Slater [1], Jennie Rose [1], Ellinor Olander [2], Karen Matvienko-Sikar [3], Sarah Redsell [1]

[1]Faculty of Health, Education, Medicine and Social Care, Anglia Ruskin University, Cambridge, CB1 1PT, UK
[2]Centre for Maternal and Child Health Research, City, University of London, London, EC1V 0HB, UK
[3]School of Public Health, University College Cork, Cork, T12 HY8E, Ireland

v2 **First published:** 16 Jan 2020, **3**:2
https://doi.org/10.12688/hrbopenres.12980.1
Latest published: 10 Jun 2020, **3**:2
https://doi.org/10.12688/hrbopenres.12980.2

Abstract

Background: Childhood overweight and obesity is a major public health issue. Responsive feeding has been identified as having a protective effect against child overweight and obesity, and is associated with healthy weight gain during infancy. Responsive feeding occurs when the caregiver recognises and responds in a timely and developmentally appropriate manner to infant hunger and satiety cues. Despite its benefits, responsive feeding is not ubiquitous. To better support caregivers to engage in responsive feeding behaviours, it is necessary to first systematically identify the barriers and enablers associated with this behaviour. This mixed-methods systematic review therefore aims to synthesise evidence on barriers and enablers to responsive feeding using the COM-B model of behavioural change.
Methods: 7 electronic databases will be searched (Maternal and Infant Care, CINAHL, Cochrane, PubMed, Medline, PsycINFO, EMBASE). Studies examining factors associated with parental responsive and non-responsive feeding of infants and children (<2 years) will be included. Papers collecting primary data, or analysing primary data through secondary analysis will be included. All titles, abstracts and full texts will be screened by two reviewers. Quantitative and qualitative data from all eligible papers will be independently extracted by at least two reviewers using pre-determined standardised data extraction forms. Two reviewers will independently assess the methodological quality of the studies using the Mixed Methods Appraisal Tool (MMAT). This review will be reported according to the Preferred Reporting Items for Systematic reviews and Meta Analyses (PRISMA).
Ethics and dissemination: Ethical approval is not required for this review as no primary data will be collected, and no identifying personal information will be present. The review will be disseminated in a peer reviewed journal.
PROSPERO registration: CRD42019144570 (06/08/2019)

Open Peer Review

Reviewer Status ✓ ✓

	Invited Reviewers	
	1	**2**
version 2 (revision) 10 Jun 2020	✓ report	✓ report
version 1 16 Jan 2020	? report	✓ report

1 **Heidi Bergmeier**, Monash University, Melbourne, Australia

2 **Jackie Blissett**, Aston University, Birmingham, UK

Any reports and responses or comments on the article can be found at the end of the article.

Keywords
Responsive feeding, caregiver, infant, overweight, obesity, systematic review, protocol

This article is included in the Maternal and Child Health collection.

Corresponding author: Vicki Slater (vicki.slater@anglia.ac.uk)

Author roles: Slater V: Methodology, Project Administration, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Rose J**: Methodology, Writing – Original Draft Preparation, Writing – Review & Editing; **Olander E**: Methodology, Writing – Original Draft Preparation, Writing – Review & Editing; **Matvienko-Sikar K**: Conceptualization, Methodology, Writing – Original Draft Preparation, Writing – Review & Editing; **Redsell S**: Conceptualization, Funding Acquisition, Methodology, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: Health Research Board Ireland [ARPP-A 2018-011] This work was also supported by Anglia Ruskin University.
The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

How to cite this article: Slater V, Rose J, Olander E *et al.* **Barriers and enablers to Caregivers Responsive feeding Behaviour (CRiB): A mixed method systematic review protocol [version 2; peer review: 2 approved]** HRB Open Research 2020, **3**:2 https://doi.org/10.12688/hrbopenres.12980.2

First published: 16 Jan 2020, **3**:2 https://doi.org/10.12688/hrbopenres.12980.1

REVISED **Amendments from Version 1**

Following suggestions from the reviewers, we have amended the introduction to address their comments. Throughout the manuscript, the phrasing was adjusted to avoid individual personal responsibility. In the first paragraph we have included information on the importance of the first 2 years of life in relation to both feeding, and other developmental processes. We have also included a sentence reporting that responsive feeding may be protective, and included a citation to support this. At the end of the second paragraph, we have been more specific the age range of participants in a statement made, and have provided more recent citations to support this. We have also been more specific in regards to parental perception of infant weight, and which feeding styles may correspond. In paragraph 3, we have provided more information about a reference cited, including types of populations and additional information on the factors identified in that review. At the end of this paragraph, we have included that evidence is mixed, and included previous literature mentioning how infant characteristics (such as fussiness, appetitive traits, and genetics) may influence parent feeding. The repetition of the word "supports" (in paragraph 4) was removed and an alternative given.

Any further responses from the reviewers can be found at the end of the article

Introduction

The number of children overweight under the age of five is estimated to be over 41 million[1], leading to prevalence of overweight and obesity in infants and children being identified as a major public health issue[2]. Infancy is posited to be a sensitive period for the development of child overweight, particularly the first two years[3,4]. The first 2 years are especially important because, during this time, children's feeding preferences and behaviours are influenced by modifiable parental approaches to child feeding that can lead to childhood obesity[5,6]. Throughout this time, infants experience bottle and breastfeeding, complementary feeding[7], leading onto a solid diet. Beyond this, other critical aspects of child development occur, including development of attachment[8] and self-regulation[9], and attention[10] which may interact with feeding. For instance, during the first 2 years of life, infants learn to self-regulate their food intake, from their own appetitive traits[11] and from their environment[12]. Childhood obesity can lead to immediate and long term health complications, including, obstructive sleep apnoea, high blood pressure and obesity related cardiovascular disease[13]. Children who have obesity are more likely to have obesity in adulthood, which is associated with a higher risk of many chronic diseases[14]. Parental feeding practices and styles (as outlined in Table 1) are a crucial determinant in the aetiology of childhood obesity[15], with responsive feeding (both bottle and breast feeding) identified as having a protective effect against child overweight and obesity, and an associated reduced risk of overweight and obesity[16,17].

Responsiveness is a reciprocal dimension of feeding in which an infant or young child provides clear feeding cues, such as hunger and satiety, and the caregiver responds in a prompt and developmentally appropriate manner[3]. Responsive feeding can relate to early consumption of breast and/or formula milk, as well as in relation to introducing and establishing solid food consumption. From a very young age infants have the ability to self-regulate their food intake[18] but the volume of food an infant consumes depends on their caregiver's ability to recognise and respond appropriately to their infant's hunger and satiety cues, as well as this ability to self-regulate their intake. Non-responsive feeding may occur between an infant and caregiver when a caregiver misinterprets or misunderstands the infant's hunger and satiety cues, and so responds by offering a developmentally inappropriate amount, type or texture of food. Non-responsive feeding may include, instrumental feeding, pressuring a child to eat, and controlling food intake, which have all been associated with childhood overweight and obesity[19–21]. Non-responsive feeding can be conceptualised as being at the opposite end of the spectrum to responsive feeding and research suggests it has a role in childhood weight gain and overweight[3]. For example, caregivers who have an inability to recognise an infant's weight is within a healthy range (with the infant being underweight or overweight), often utilise non-responsive feeding styles such as food restriction (for those infants perceived as overweight), or pressuring-to eat

Table 1. Table demonstrating definitions of different parental feeding styles and how they may relate to childhood overweight.

Parental feeding styles example	Definition
Instrumental feeding	Using food as a reward for a desired outcome (i.e. a positive behaviour). This may strengthen the preference for that food (often high calorie)[19] .
Pressuring to eat	Prompting to eat more food; the caregiver is concerned with increasing the child's food intake (such as adding cereal to a child's bottle to increase intake)[22].
Monitoring food intake	Monitoring a child's food intake; may be expected to result in a lower BMI, however research has often identified no weight change[23].
Responsive feeding	Responding promptly and in a developmentally appropriate manner to infant cues of satiety and hunger[3].
Food restriction	Minimising access to food to reduce child's weight. This can result in the opposite effect by causing the child to seek out the restricted food[19].

(for those infants perceived as underweight)[24,25]. These feeding styles have been associated with children (from birth through to age 18 years inclusive) developing unhealthy eating styles (such as emotional eating and eating in the absence of hunger), leading to an increased risk of obesity[26–28].

Multiple factors may affect how caregivers engage in feeding behaviours. A recent qualitative review included studies consisting of predominantly or only mothers, in Europe, North America, Australasia and Mexico, with the majority of studies recruiting low-income caregivers[29]. This review explored parental experiences of infant feeding and highlighted that some of these influencing factors are environmentally based.). These included costs of infant feeding[30], time constraints[31], sources of information (official recommendations[32], healthcare professionals[33], and friends and family[30], confusion of information from multiple sources[34], and pressure from family[35]. Additional factors include psychological factors (such as maternal mental health[36] and maternal executive functioning[37]), and social factors (including, interpersonal relationships, marital status, occupation, and the influence of family and friends)[29]. Parental knowledge, beliefs, and prior experience also influence their feeding practices and styles[29]. Previous literature, such as an analysis of the GEMINI cohort study, has noted the importance of genetics in appetitive traits including slowness in eating, satiety responsiveness, food responsiveness and enjoyment of food[11]. Caregivers may also be simply responding to their infant's appetite[12] with infants varying in appetite[38]. Additionally, parents have been found to adjust their feeding style dependent on their child's weight; an infant who is perceived by the parent to be underweight may be pressured to eat more, whilst parents may restrict their infant's food intake if they perceive their infant to be overweight[24]. However, evidence is mixed for maternal pressure to eat, with some research suggesting pressure to eat is associated with increased risk of obesity[3], meanwhile it has also been reported that pressure to eat is associated with lower weight at 2 years[21]. Infant temperament may also influence feeding practices, with infants perceived as fussier, less responsive to food, and more responsive to internal satiety cues being pressured more[39]. Although the evidence is mixed, it appears that responsive feeding is protective against the development of childhood obesity[40].

Although sources such as the WHO UNICEF Baby Friendly Initiative (BFI) exist to provide guidance on improving caregivers' knowledge about responsive feeding[41,42], parents still report uncertainty about how 'best' to feed their infants[29]. It is also suggested that healthcare professionals have not been equipped appropriately to assist caregivers in responsive feeding[43]. In order to improve information and support for caregivers it is necessary to examine the barriers and enablers to responsive feeding. Understanding the underlying factors that influence responsive feeding will contribute to the development of a caregiver-focused support that aids responsive feeding. Systematic reviews have reported that healthcare professionals providing responsive feeding guidance to mothers on identifying and responding to children's satiety and hunger cues can lead to healthy weight status/gain in early childhood[18,44–47].

Of central importance to improving and supporting appropriate responsive feeding behaviours is the fact that some determinants of this behaviour are modifiable, such as caregiver knowledge, and may be specifically targeted through interventions. Models of behaviour change are fundamental to informing such interventions and strategies to promote positive public health[48]. The COM-B (capability, opportunity, motivation and behaviour) model for example provides a framework for understanding behaviour change, and incorporates 'capability', 'opportunity', and 'motivation' are conceptualised as the three conditions necessary for behavioural change[48]. Utilising the COM-B model to map barriers and enablers of responsive feeding behaviours provides a useful and tangible first step towards development of interventions and supports to assist primary caregivers to engage in responsive feeding behaviours that are associated with reduced risk of childhood obesity.

Research questions

What are the barriers and enablers associated to responsive and non-responsive feeding to prevent childhood overweight and obesity?

Method

Study registration

This study has been registered with the international Prospective Register of Systematic Reviews on 6th August 2019 (PROSPERO; registration number, CRD42019144570).

Study design

A step-by-step flow diagram will be used in accordance with the Preferred Reporting Items for Systematic review and Meta-analysis protocol (PRISMA-P) guidelines, to demonstrate the study selection process, and rationale will be provided for excluded studies. The entirety of the review will follow the PRISMA-P checklist.

Ethics

Ethical approval is not required for this review as no experimental or observational research will be carried out, and no identifying personal information will be present or collected.

Types of studies

This review will examine both qualitative and quantitative primary studies that have examined factors associated with caregiver responsive and nonresponsive feeding of children up to 2 years old. All studies collecting primary data, or analysing primary data through secondary analyse will be included. Quantitative research such as, randomised control trials, case-control studies, retrospective and prospective cohort studies, cross-sectional and longitudinal studies will be included. In addition, qualitative studies, including research conducted as part of the process evaluation of an intervention trial, will be included. A broad remit of studies will be included in order to ensure factors that emerge in a variety of contexts and settings are identified. The studies must be published in English due to limitations in translation resources, and there will be no restriction on publication date.

Inclusion and exclusion criteria

Population

Primary caregivers (parents, guardians) of healthy children ≤ 2 years old. Studies of infants with medical conditions affecting feeding and growth, very preterm infants <32 weeks gestation, low birth weight (VLBW) <2500 g[49], and those who have been fed via a naso-gastric tube will be excluded from this review. We will also exclude studies including infants with major sensory and physical disabilities (e.g. blindness, deafness) because of the additional challenges that caregivers of these infants may find implementing responsive feeding in early life. To ensure the findings can contribute to the development of an intervention to reduce the risk of childhood overweight in a UK and Ireland-relevant population, studies conducted in countries where responsive feeding is used to improve weight gain in malnourished infants will be excluded. Studies will only be included if they are carried out in an economically developed country (as indicated by membership of the Organisation for Economic Co-operation and Development (OECD))[50].

Exposures

The exposures of interest are the barriers and enablers associated with primary caregiver feeding responsiveness and non-responsiveness. Examples of non-responsive feeding include, pressuring a child to eat, instrumental feeding, and controlling food intake which have all been associated with childhood overweight and obesity[19–21].

Outcomes

To be included, studies need to report a factor that could be a barrier or enabler to responsive feeding, for example an intervention that includes anticipatory guidance. Responsive feeding during first 2 years of life as reported by the study authors. This will include outcomes measured using established scales, e.g. Child Feeding Questionnaire[51], and qualitative data in relation to caregiver feeding practices (such as, ensuring feeding context with few distractions)[52]. Results from quantitative studies (for example, p-values, odds ratios, and confidence intervals) will be used to determine the existence and strength of associations between factors and feeding, whilst results from the qualitative studies (such as themes) will be synthesised to narratively explore barriers and enablers experienced by caregivers to responsive feeding.

Method for identifying studies for inclusion

The following databases will be searched: CINAHL, Cochrane Library, Medline, Embase, PubMed, PsycINFO, Maternity and Infant Care database. All databases will be searched from inception. All databases will be searched using the comprehensive search strategy outlined below.

Search strategy

The searches will be based on concepts associated with infant feeding behaviours to include proxy terms for responsive and non-responsive feeding and any barriers or enablers to primary caregiver engagement. We will use the following search strategy:

Feeding type concept: authoritarian OR authoritative OR bottle feeding OR breastfeeding OR breast feeding OR breast-feeding OR complementary feeding OR controlled feeding OR controlling feeding OR emotional feeding OR formula feeding OR non-responsive* OR pressured OR restricted feeding OR restricting feeding OR responsive* OR self-feeding OR unresponsive* OR weaning

Influencing factors concept: barrier* OR belief* OR challenge* OR determinant* OR enabler* OR experiences OR facilitator* OR facto* OR influenc* OR obstacle* OR parenting style* OR risk OR risk factors OR view*

Subject concept: babies OR baby OR child OR infant* OR maternal OR mother* OR neonat* OR newborn* OR parent* OR paediatric OR pediatric OR toddler*

Study design concept: cohort OR cross-sectional OR experiment* OR intervention OR interview OR observation* OR process evaluation OR qualitative.

Study selection

One researcher (VS) will independently screen titles and abstracts of all identified papers against eligibility criteria. Two other researchers (JR, SR) will each screen titles and abstracts of half of the identified papers. At least two members of the researcher team (VS, JR, KM, EO, SR) will then independently screen full texts of potentially eligible articles for inclusion. Any discrepancies will be resolved by discussion or recourse to a third reviewer from the team (VS, JR, KM, EO, SR). If necessary, the reviewers will attempt to contact authors of original articles to request missing information or for clarification. All references will be imported into EndNote and duplicates will be removed through EndNote and through manual screening.

Data extraction

Raw data from qualitative studies will be extracted onto an Excel spreadsheet and qualitative and quantitative data will be extracted using pre-determined standardised data extraction forms (see extended data[53,54]).

For the qualitative data extraction one researcher (SR) will extract the study participant, setting and design details of each paper and another researcher (JR) will download any qualitative data from each study to word files. Qualitative data will include the quotes, interpretative text and any other supplementary data. Two researchers (JR, SR) will each examine the qualitative data from three of the included papers and code the data relevant to barriers and enablers to responsive feeding to the COM-B framework. The researchers will meet to compare their interpretation of the data and coding, and any discrepancies will be discussed and resolved.

The quantitative data will be extracted independently by two reviewers (KM, EO), with one researcher (VS) extracting data from all quantitative studies, whilst two more researchers

(KM, EO) will each extract data from half of the identified studies. The general study details (including author, title, date) will be extracted along with more specific details such as participant information, infant weight, and intervention details. Results of the study will be recorded (such as, confidence intervals, p-values, and standard deviations). Identified determinants and association factors identified in quantitative studies will be mapped onto the COM-B model, and will be synthesised with consideration given to the context of the strength of associations and effects. Researchers (VS, KM, EO) will meet to discuss findings of the data extraction and resolve any discrepancies.

Assessment of risk of bias

Two reviewers (VS, SR) will independently assess the methodological quality of these studies using the Mixed Methods Appraisal Tool (MMAT)[55]; any discrepancies will be resolved through consensus discussion or recourse to a third member of the research team (JR, KM, EO). MMAT provides two screening questionnaires, which are used in the appraisal stage of mixed methods systematic reviews. The MMAT is used to appraise five study types: randomised control trials, non-randomised studies, quantitative studies, qualitative research, and mixed methods design studies.

Strategy for data synthesis

We will use narrative text along with tables of the findings from the included studies, structured around: 1) the relation of barriers and enablers to responsive feeding and non-responsive feeding, and 2) the existence and strength of association between factors and responsive and/or non-responsive feeding outcomes. Depending on the heterogeneity of quantitative studies identified, a meta-analysis will be conducted.

To synthesise the extracted qualitative data, we will use a 'best fit' framework synthesis, as outlined by Booth and Carroll[56]. Framework synthesis is a structured approach in which data are analysed using concepts or themes specified *a priori*[57,58]. The 'best fit' approach follows seven distinct steps, which includes incorporation of inductively emerging themes with pre-specified themes within the *a priori* framework. This allows for a flexible and rigorous approach to qualitative evidence synthesis[59]. It provides a pragmatic approach to providing context-specific information and understanding of parents' experiences of, and barriers and facilitators to responsive feeding. The framework to be used is the Capability, Opportunity, and Motivation Model of Behaviour (COM-B model)[48], and findings will be mapped onto this model.

Participant quotations and authors' interpretations in the results sections of included papers will be coded using the *a priori* COM-B framework. An inductive thematic analysis of the data will also be conducted and additional themes, which are not accounted for by the COM-B model, will be added to the coding framework. Concepts from the COM-B framework and inductive thematic analysis will then be revisited and synthesised into a final set of themes.

Quantitative data will be extracted onto the COM-B model, with evidence of each barrier and enabler to responsive feeding. All stages of analysis will be conducted by one researcher (VS) and will be reviewed and discussed by all members of the study team to reach consensus on the final evidence synthesis.

Subgroup/subset analysis

Subgroup analysis will be determined and led by the data, but may include high/low income, mothers/fathers, primi/multiparous mothers.

Dissemination of findings

The results of this systematic review will be published in a peer-reviewed journal.

Study status

As of the 6th January 2020, the selected databases have been searched, titles/abstracts have been screened, full texts have been screened against eligibility criteria, and data extraction has started.

Discussion

The aim of this systematic review is to analyse the scientific literature exploring and reporting on barriers and enablers to responsive feeding. The findings will inform researchers, health professionals and caregivers about the ways in which responsive feeding during infancy might be promoted, supported and improved. This could include identification of the groups of caregivers who find responsive feeding more challenging and a clear understanding of the behavioural components which may make this difficult. This should inform the co-production of specific education and support packages for both health professionals and caregivers.

Evidence around the barriers and enablers associated with responsive feeding will also enable researchers to inform health professional communities and to develop and/or adapt any existing interventions. This has the potential to contribute to reduce inappropriate feeding and could be particularly important in the prevention of childhood obesity. It is anticipated that the findings may also inform intervention development in ensuring that barriers to responsive feeding are tackled. In regards to intervention development and improvement, it is important that where it is not possible to modify a particular determinant (for example, maternal executive functioning, or infant temperament) the intervention may be adapted to suit the caregivers specific needs.

Potential limitations

This review will only include studies which are published in English, due to limitations in translation resources. This could mean excluding other relevant information based on language barriers. Secondly, unpublished literature will not be included, possibly leaning towards an increased risk of publication bias in the research that is included.

Amendments

If we need to make any amendments to this protocol, we will give the date of each amendment, describe the change and provide rationale in this section.

Data availability

Underlying data

No data is associated with this article.

Extended data

Figshare: CRiB Quantitative Data Extraction Form. https://doi.org/10.25411/aru.11498637.v1[60]

This project contains the following extended data:

- Quant Data Extraction.docx (Study data extraction form for quantitative data)

Figshare: CRiB Qualitative Data Extraction Form. https://doi.org/10.25411/aru.11498667.v1[53]

This project contains the following extended data:

- Qualitative Data Extraction Form Blank.xlsx (Study data extraction form for qualitative data)

Reporting Guidelines

Repository: PRISMA-P checklist for 'Barriers and enablers to Caregivers Responsive feeding Behaviour (CRiB): A mixed method systematic review protocol'. https://doi.org/10.25411/aru.11378844.v2[54]

References

1. World Health Organisation: **Childhood overweight and obesity**. Global Strategy on Diet, Physical Activity and Health, 2019.
Reference Source
2. Crouch P, O'Dea JA, Battisti R: **Child feeding practices and perceptions of childhood overweight and childhood obesity risk among mothers of preschool children.** *Nutr Diet.* 2007; **64**(3): 151–158.
Publisher Full Text
3. DiSantis KI, Hodges EA, Johnson SL, *et al.*: **The role of responsive feeding in overweight during infancy and toddlerhood: a systematic review.** *Int J Obes (Lond).* 2011; **35**(4): 480–92.
PubMed Abstract | Publisher Full Text | Free Full Text
4. World Health Organisation: **Report of the Commission on Ending Childhood Obesity**. Geneva: World Health Organisation. 2016.
Reference Source
5. Birch LL, Ventura AK: **Preventing childhood obesity: what works?** *Int J Obes (Lond).* 2009; **33**(Suppl 1): S74–S81.
PubMed Abstract | Publisher Full Text
6. Woo Baidal JA, Locks LM, Cheng ER, *et al.*: **Risk Factors for Childhood Obesity in the First 1,000 Days: A Systematic Review.** *Am J Prev Med.* 2016; **50**(6): 761–779.
PubMed Abstract | Publisher Full Text
7. Barrera CM, Perrine CG, Li R, *et al.*: **Age at Introduction to Solid Foods and Child Obesity at 6 Years.** *Child Obes.* 2016; **12**(3): 188–192.
PubMed Abstract | Publisher Full Text | Free Full Text
8. Ainsworth MS, Bowlby J: **An ethological approach to personality development.** *American Psychologist.* 1991; **46**(4): 333–341.
Publisher Full Text
9. Fox MK, Devaney B, Reidy K, *et al.*: **Relationship between Portion Size and Energy Intake among Infants and Toddlers: Evidence of Self-Regulation.** *J Am Diet Assoc.* 2006; **106**(1 Suppl 1): S77–83.
PubMed Abstract | Publisher Full Text
10. Shaddy DJ, Colombo J: **Developmental Changes in Infant Attention to Dynamic and Static Stimuli.** *Infancy.* 2004; **5**(3): 355–365.
Publisher Full Text
11. Llewellyn CH, van Jaarsveld CHM, Johnson L, *et al.*: **Nature and nurture in infant appetite: analysis of the Gemini twin birth cohort.** *Am J Clin Nutr.* 2010; **91**(5): 1172–9.
PubMed Abstract | Publisher Full Text
12. Webber L, Cooke L, Hill C, *et al.*: **Associations between Children's Appetitive Traits and Maternal Feeding Practices.** *J Am Diet Assoc.* 2010; **110**(11): 1718–1722.
PubMed Abstract | Publisher Full Text
13. Daniels SR: **The consequences of childhood overweight and obesity.** *Future Child.* 2006; **16**(1): 47–67.
PubMed Abstract | Publisher Full Text
14. Lloyd LJ, Langley-Evans SC, McMullen S: **Childhood obesity and risk of the adult metabolic syndrome: a systematic review.** *Int J Obes (Lond).* 2012; **36**(1): 1–11.
PubMed Abstract | Publisher Full Text | Free Full Text
15. Birch LL, Fisher JO: **Development of eating behaviors among children and adolescents.** *Pediatrics.* 1998; **101**(3 Pt 2): 539–549.
PubMed Abstract
16. Adams EL, Marini ME, Stokes J, *et al.*: **INSIGHT responsive parenting intervention reduces infant's screen time and television exposure.** *Int J Behav Nutr Phys Act.* 2018; **15**(1): 24.
PubMed Abstract | Publisher Full Text | Free Full Text
17. Matvienko-Sikar K, Toomey E, Delaney L, *et al.*: **Effects of healthcare professional delivered early feeding interventions on feeding practices and dietary intake: A systematic review.** *Appetite.* 2018; **123**: 56–71.
PubMed Abstract | Publisher Full Text
18. Drewett RF, Woolridge M: **Milk taken by human babies from the first and second breast.** *Physiol Behav.* 1981; **26**(2): 327–9.
PubMed Abstract | Publisher Full Text
19. Rodgers RF, Paxton SJ, Massey R, *et al.*: **Maternal feeding practices predict weight gain and obesogenic eating behaviors in young children: a prospective study.** *Int J Behav Nutr Phys Act.* 2013; **10**: 24.
PubMed Abstract | Publisher Full Text | Free Full Text
20. Carnell S, Wardle J: **Associations between multiple measures of parental feeding and children's adiposity in United Kingdom preschoolers.** *Obesity (Silver Spring).* 2007; **15**(1): 137–144.
PubMed Abstract | Publisher Full Text
21. Farrow C, Blissett J: **Does maternal control during feeding moderate early infant weight gain?** *Pediatrics.* 2006; **118**(2): e293–8.
PubMed Abstract | Publisher Full Text
22. Thompson AL, Adair LS, Bentley ME: **Pressuring and restrictive feeding styles influence infant feeding and size among a low-income African-American sample.** *Obesity (Silver Spring).* 2013; **21**(3): 562–571.
PubMed Abstract | Publisher Full Text | Free Full Text
23. Webber L, Cooke L, Hill C, *et al.*: **Child adiposity and maternal feeding practices: a longitudinal analysis.** *Am J Clin Nutr.* 2010; **92**(6): 1423–1428.
PubMed Abstract | Publisher Full Text
24. Jansen PW, Tharner A, van der Ende J, *et al.*: **Feeding practices and child weight: is the association bidirectional in preschool children?** *Am J Clin Nutr.* 2014; **100**(5): 1329–1336.
PubMed Abstract | Publisher Full Text
25. Harrison M, Brodribb W, Davies PSW, *et al.*: **Impact of Maternal Infant Weight Perception on Infant Feeding and Dietary Intake.** *Matern Child Health J.* 2018; **22**(8): 1135–1145.
PubMed Abstract | Publisher Full Text
26. Demir D, Bektas M: **The effect of childrens' eating behaviors and parental feeding style on childhood obesity.** *Eat Behav.* 2017; **26**: 137–142.
PubMed Abstract | Publisher Full Text
27. Farrow CV, Haycraft E, Blissett JM: **Teaching our children when to eat: how parental feeding practices inform the development of emotional eating—a**

longitudinal experimental design. *Am J Clin Nutr.* 2015; **101**(5): 908–913.
PubMed Abstract | Publisher Full Text

28. Clark HR, Goyder E, Bissell P, *et al.*: **How do parents' child-feeding behaviours influence child weight? Implications for childhood obesity policy.** *J Public Health (Oxf).* 2007; **29**(2): 132–141.
PubMed Abstract | Publisher Full Text

29. Matvienko-Sikar K, Kelly C, Sinnott C, *et al.*: **Parental experiences and perceptions of infant complementary feeding: a qualitative evidence synthesis.** *Obes Rev.* 2018; **19**(4): 501–517.
PubMed Abstract | Publisher Full Text

30. Monterrosa EC, Pelto GH, Frongillo EA, *et al.*: **Constructing maternal knowledge frameworks. How mothers conceptualize complementary feeding.** *Appetite.* 2012; **59**(2): 377–384.
PubMed Abstract | Publisher Full Text

31. Brown A, Lee M: **An exploration of experiences of mothers following a baby-led weaning style: developmental readiness for complementary foods.** *Matern Child Nutr.* 2013; **9**(2): 233–243.
PubMed Abstract | Publisher Full Text | Free Full Text

32. Arden MA, Abbott RL: **Experiences of baby-led weaning: trust, control and renegotiation.** *Matern Child Nutr.* 2015; **11**(4): 829–844.
PubMed Abstract | Publisher Full Text | Free Full Text

33. Cameron SL, Heath ALM, Taylor RW: **Healthcare professionals' and mothers' knowledge of attitudes to and experiences with, Baby-Led Weaning: a content analysis study.** *BMJ Open.* 2012; **2**(6): e001542.
PubMed Abstract | Publisher Full Text | Free Full Text

34. Schwartz C, Madrelle J, Vereijken CMJL, *et al.*: **Complementary feeding and *"donner les bases du goût" (providing the foundation of taste)*. A qualitative approach to understand weaning practices, attitudes and experiences by French mothers.** *Appetite.* 2013; **71**: 321–331.
PubMed Abstract | Publisher Full Text

35. Kuswara K, Laws R, Kremer P, *et al.*: **The infant feeding practices of Chinese immigrant mothers in Australia: A qualitative exploration.** *Appetite.* 2016; **105**: 375–384.
PubMed Abstract | Publisher Full Text

36. Elias CV, Power TG, Beck AE, *et al.*: **Depressive Symptoms and Perceptions of Child Difficulty Are Associated with Less Responsive Feeding Behaviors in an Observational Study of Low-Income Mothers.** *Child Obes.* 2016; **12**(6): 418–425.
PubMed Abstract | Publisher Full Text

37. Fuglestad AJ, Demerath EW, Finsaas MC, *et al.*: **Maternal executive function, infant feeding responsiveness and infant growth during the first 3 months.** *Pediatr Obes.* 2017; **12 Suppl 1**: 102–110.
PubMed Abstract | Publisher Full Text

38. Agras WS, Kraemer **HC,** Berkowitz **RI,** *et al.*: **Influence of early feeding style on adiposity at 6 years of age.** *J Pediatr.* 1990; **116**(5): 805–9.
PubMed Abstract | Publisher Full Text

39. Farrow CV, Galloway AT, Fraser K: **Sibling eating behaviours and differential child feeding practices reported by parents.** *Appetite.* 2009; **52**(2): 307–312.
PubMed Abstract | Publisher Full Text

40. Daniels LA, Mallan KM, Nicholson JM, *et al.*: **Outcomes of an Early Feeding Practices Intervention to Prevent Childhood Obesity.** *Pediatrics.* 2013; **132**(1): e109–18.
PubMed Abstract | Publisher Full Text

41. UNICEF: **The evidence and rationale for the UNICEF UK Baby Friendly Initiative standard**. 2013.
Reference Source

42. UNICEF: **Reponsive feeding: Supporting close and loving relationships**. 2016.
Reference Source

43. Redsell SA, Atkinson PJ, Nathan D, *et al.*: **Preventing childhood obesity during infancy in UK primary care: a mixed-methods study of HCPs' knowledge, beliefs and practice.** *BMC Fam Pract.* 2011; **12**(1): 54.
PubMed Abstract | Publisher Full Text | Free Full Text

44. Paul IM, Savage JS, Anzman SL, *et al.*: **Preventing obesity during infancy: a pilot study.** *Obesity (Silver Spring).* 2011; **19**(2): 353–61.
PubMed Abstract | Publisher Full Text | Free Full Text

45. Redsell SA, Edmonds B, Swift JA, *et al.*: **Systematic review of randomised controlled trials of interventions that aim to reduce the risk, either directly or indirectly, of overweight and obesity in infancy and early childhood.** *Matern Child Nutr.* 2016; **12**(1): 24–38.
PubMed Abstract | Publisher Full Text | Free Full Text

46. Savage JS, Hohman EE, Marini ME, *et al.*: **INSIGHT responsive parenting intervention and infant feeding practices: randomized clinical trial.** *Int J Behav Nutr Phys Act.* 2018; **15**(1): 64.
PubMed Abstract | Publisher Full Text | Free Full Text

47. Spill MK, Callahan EH, Shapiro MJ, *et al.*: **Caregiver feeding practices and child weight outcomes: a systematic review.** *Am J Clin Nutr.* 2019; **109**(Suppl_7): 990S–1002S.
PubMed Abstract | Publisher Full Text

48. Michie S, van Stralen MM, West R: **The behaviour change wheel: a new method for characterising and designing behaviour change interventions.** *Implement Sci.* 2011; **6**(1): 42.
PubMed Abstract | Publisher Full Text | Free Full Text

49. World Health Organisation: **ICD-11 for Mortality and Morbidity Statistics (ICD-11 MMS)**. 2018.
Reference Source

50. **Development, O.f.t.E.C.-O.a.**.
Reference Source

51. Johnson SL, Birch LL: **Parents' and children's adiposity and eating style.** *Pediatrics.* 1994; **94**(5): 653–661.
PubMed Abstract

52. Black MM, Aboud FE: **Responsive feeding is embedded in a theoretical framework of responsive parenting.** *J Nutr.* 2011; **141**(3): 490–4.
PubMed Abstract | Publisher Full Text | Free Full Text

53. Slater V, Rose J, Matvienko-Sikar K, *et al.*: **CRiB Qualitative Data Extraction Form.** *figshare.* Figure. 2020.
http://www.doi.org/10.25411/aru.11498667.v1

54. Slater V, Rose J, Matvienko-Sikar K, *et al.*: **Barriers and enablers to Caregivers Responsive feeding Behaviour (CRiB): A mixed method systematic review protocol PRISMA-P checklist.** *figshare.* Figure. 2019.
http://www.doi.org/10.25411/aru.11378844.v2

55. Pluye P, Robert E, Cargo M, *et al.*: **Proposal: a mixed methods appraisal tool for systematic reviews**. 2018 I.C. Canadian Intellectual Property Office, Editor. 2011.
Reference Source

56. Booth A, Carroll C: **How to build up the actionable knowledge base: the role of 'best fit' framework synthesis for studies of improvement in healthcare.** *BMJ Qual Saf.* 2015; **24**(11): 700–8.
PubMed Abstract | Publisher Full Text | Free Full Text

57. Carroll C, Booth A, Cooper K: **A worked example of "best fit" framework synthesis: a systematic review of views concerning the taking of some potential chemopreventive agents.** *BMC Med Res Methodol.* 2011; **11**: 29.
PubMed Abstract | Publisher Full Text | Free Full Text

58. Dixon-Woods M: **Using framework-based synthesis for conducting reviews of qualitative studies.** *BMC Med.* 2011; **9**: 39.
PubMed Abstract | Publisher Full Text | Free Full Text

59. Carroll C, Booth A, Leaviss J, *et al.*: **"Best fit" framework synthesis: refining the method.** *BMC Med Res Methodol.* 2013; **13**: 37.
PubMed Abstract | Publisher Full Text | Free Full Text

60. Slater V, Rose J, Matvienko-Sikar K, *et al.*: **CRiB Quantitative Data Extraction Form.** *figshare.* Figure. 2020.
http://www.doi.org/10.25411/aru.11498637.v1

Open Peer Review

Current Peer Review Status: ✔ ✔

Version 2

Reviewer Report 13 July 2020

https://doi.org/10.21956/hrbopenres.14179.r27525

✔ **Jackie Blissett**
Department of Psychology, School of Life and Health Sciences, Aston University, Birmingham, UK

The author have addressed my original suggestions well, I have no more comments to make.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Parent feeding practices, child temperament, infant and child feeding, childhood obesity.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 02 July 2020

https://doi.org/10.21956/hrbopenres.14179.r27526

✔ **Heidi Bergmeier**
Monash Centre for Health Research and Implementation, Monash University, Melbourne, Australia

The authors have addressed all comments well.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Childhood obesity prevention, parent-child interactions, parent-child feeding interactions, child attachment, maternal and child obesity prevention in early parenting years, observational measures for assessing parent-child feeding interactions.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 07 May 2020

https://doi.org/10.21956/hrbopenres.14066.r27299

Jackie Blissett
Department of Psychology, School of Life and Health Sciences, Aston University, Birmingham, UK

This paper reports a mixed-methods systematic review protocol which aims to summarise and integrate current knowledge on the barriers and enablers of parental responsive feeding of infants and young children under two years. There is substantial evidence justifying the need for further investigation of early influences on children's feeding, because these may be key predictors of later overweight and obesity. This is an important area of research, in need of consolidation of findings, and thus a systematic review of this literature will be a welcome contribution to the field.

The protocol is well designed and clearly justified. I have a few comments which I hope will fine tune the manuscript.

Please consider adjusting phrasing to ensure 'person first' language and to avoid emphasis on individual personal responsibility: for example, 'Children who are obese are more likely to be obese in adulthood,therefore exposing themselves to a higher risk of many chronic diseases' would be better phrased as 'Children who have obesity are more likely to have obesity in adulthood, which is associated with a higher risk of many chronic diseases'.

A wide range of individual and social factors influencing parental use of responsive feeding are listed in the introduction but core literature is missing, which considers the role of the infant characteristics in responsive feeding. It is likely to be much easier to feed responsively when an infant has appetite within a healthy range, and when an infant gives clear hunger and satiety cues. Studies have shown that infant appetite is strongly related to later BMI and that this is in part genetically mediated (see Gemini cohort outputs). Parents also adjust their feeding in response to changes in weight or appetite across time (e.g. see studies on twins and siblings discordant for appetitive traits). Infants who are more temperamentally difficult may also demonstrate signals that are harder to 'read'. These will also likely constitute important barriers/enablers to responsive feeding. It is of course necessary to focus the review on targets for behaviour change that are potentially modifiable, nonetheless, those parents who are feeding infants who are at the extremes of appetite or temperament traits may also be in greatest need of tailored intervention.

Perhaps these factors can be considered in the proposed subgroup analysis, subject to the data yielded.

I was curious why permissive or 'laissez faire' was not included in search terms related to feeding type concept, given that authoritarian and authoritative are included.

I am glad to see the mixed methods approach being taken in this review, this will yield a richer picture of the overall current state of knowledge. The application of the COM-B model to structure of the review will provide an excellent mapping for subsequent intervention planning.

Is the rationale for, and objectives of, the study clearly described?
Yes

Is the study design appropriate for the research question?
Yes

Are sufficient details of the methods provided to allow replication by others?
Yes

Are the datasets clearly presented in a useable and accessible format?
Not applicable

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Parent feeding practices, child temperament, infant and child feeding, childhood obesity.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 03 Jun 2020

Vicki Slater, Anglia Ruskin University, Cambridge, UK

Many thanks for taking time to review this protocol manuscript and for your helpful comments. We have spent time addressing these. Firstly, we went through the manuscript and the phrasing was changed in order to ensure 'person first' language to ensure there is no individual personal responsibility. Secondly, we have now included previous literature which includes the role of genetics (as in the Gemini outputs), and additionally the role of infant appetite, and appetitive traits. We have now also included literature on infant fussiness and how this relates to infant feeding. Finally, you mentioned why 'permissive' or 'laissez faire were not included in our search terms. We decided that most often 'laissez faire' and 'permissive' are typically presented/written in combination with the term 'feeding', and as we included 'feeding' within our search terms, papers including 'laissez faire' or 'permissive' would therefore be picked up.
Once again, thank you for your comments and taking the time to review our manuscript.

Competing Interests: None to declare

Reviewer Report 27 April 2020

https://doi.org/10.21956/hrbopenres.14066.r27300

?

Heidi Bergmeier
Monash Centre for Health Research and Implementation, Monash University, Melbourne, Australia

Thank you for the opportunity to review the content of the published article titled: "*Barriers and enablers to caregivers responsive feeding behaviour (CRiB): A mixed method systematic review protocol".* I look forward to reading the results of the review once it has been finalised and published. With regards to the current protocol article, I have provided comments below relating to evidence included in the introduction, for the authors' consideration, which I hope are helpful.

Introduction section:

Research and frameworks (including WHO Commission on Ending Childhood Obesity) would also suggest that the first 2000 days (conception to five years) are critical periods for child development, including establishing eating and weight gain patters. Why might the first two years be particularly important within this time frame? E.g., What specifically happens in a child's life, in relation to eating/weight development, that makes it a critical stage? It seems important to mention that responsive feeding across the first two years will involve periods of breast/bottle feeding, transitioning to solids and for almost all infants, an exclusively solid diet - where the socialisation of children's food preferences and eating behaviours and all manner of child reactions that go with it) are in full swing. Additionally, other critical foundations of child development are being laid during this early period (e.g., child attachment, self-regulation etc…) beyond the feeding scenario that may influence parent feeding/child eating-weight interactions. Hence we really need to consider child development (including weight gain) more holistically.

As per the previous comment: The first sentence in second paragraph of this paper reminds us that feeding is a reciprocal process. Again in the discussion there is a very brief mention of child temperament. Yet the paper seems to focus mainly on the parent and what the parent does during feeding. It would seem appropriate to mention in the introduction some of the characteristics the child might bring to the 'feeding table', which need to be factored in when considering parent feeding. We also know that contributors to child overweight/obesity are more complex and broader than just parent feeding (e.g., genetics, intrauterine effects; social and health inequities, particularly now that we have evidence showing rates of under and over nutrition often go hand in hand in low to middle-income populations), and this should be acknowledged, even if beyond the scope of the proposed review.

"*Inability to recognize an infant's weight is within a healthy weight range*…": It would be helpful to clarify for the reader if this is in regards to infants being over or under weight or both and what parental feeding was observed according to types of weight perceptions. E.g., what did mothers do if they perceived their child to be underweight and then overweight?

"These feeding styles have been associated with children developing unhealthy eating styles": Please confirm for the reader if this is referring to infants or children in older age groups and provide citations for specific studies supporting the statement. Please use more recent citations if possible given that reference of review cited is from 2007. It also seems necessary to make it clear that evidence relating to

child feeding and outcomes has been mixed (and there are reasons for this), but largely, it appears that responsive feeding may be protective....

"*Multiple factors may affect how caregivers engage with feeding behaviour…":* It would be helpful to get a sense of the types of populations (socio-economic status, countries, ethnicity) that were investigated in the studies included in the review.

Understanding the underlying factors that influence responsive feeding will contribute to the development of a caregiver-focused **supports** that **supports** responsive feeding: Could one of the "supports" used in this sentence be replaced by another word?

Is the rationale for, and objectives of, the study clearly described?
Yes

Is the study design appropriate for the research question?
Yes

Are sufficient details of the methods provided to allow replication by others?
Yes

Are the datasets clearly presented in a useable and accessible format?
Not applicable

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Childhood obesity prevention, parent-child interactions, parent-child feeding interactions, child attachment, maternal and child obesity prevention in early parenting years, observational measures for assessing parent-child feeding interactions.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 03 Jun 2020

Vicki Slater, Anglia Ruskin University, Cambridge, UK

Thank you for taking the time to review our protocol manuscript, and for your insightful comments. We have taken the time to address these comments. To address your first comment, we have now included literature on why the first 2 years of life are particularly important, relating to feeding (such as breast/bottle feeding, the introduction of solid foods) but also to other developmental aspects (for example, attachment, and the development of self-regulation) which are occurring during this time. Secondly, we have now included literature on the role of infant characteristics (such as infant fussiness/temperament, infant appetite/appetitive traits) and other influences (such as genetics as in the Gemini outputs) on infant feeding. Throughout the manuscript we have addressed your comments regarding clarification; for example, a caregivers inability to recognise that their infant's weight is within a heathy range, and the mixed evidence relating to child feeding. We have now specified the age range in which feeding styles have been associated with children developing unhealthy eating styles, with 2 additional more recent citations. In regards to your comment about

the review cited, we have now included more information about this specific review, and the factors identified with relevant citations. Finally, we amended the repetition of the word ‘supports’.

Once again, thank you for your helpful comments and for taking the time to review this manuscript.

Competing Interests: None to declare