

Early Parental Responsiveness in Relation to Child Language  
Development: A Systematic Review and Conceptual Framework

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## Glossary

This list aims to define the acronyms used in this thesis.

**Contingent responsiveness (CR):** The degree or frequency of responsiveness to a child's target activities, including promptness and appropriateness of parental reactions, as well as appropriate pace that fits the child's abilities.

**Maternal directiveness (MD):** This term (i.e., *maternal*) is used when *only mothers* are implicated. Directiveness involves attempts to supportively or intrusively control or redirect children's behaviour or attention.

**Maternal responsiveness (MR):** This term (i.e., *maternal*) is used when *only mothers* are implicated. Involves only responsive behaviours (i.e., not directive behaviours). Responsiveness refers broadly to mothers' prompt appropriate and contingent responses to children's behaviours, and includes a range of behaviour types (such as responses relating to emotional support, language modelling, or maintaining children's focus of attention – see conceptual framework, Chapter Three, for more detail).

**Maternal responsiveness and directiveness (MRD):** This term (i.e., *maternal*) is used when *only mothers* are implicated. Encompasses both responsive and directive behaviours.

**Maternal sensitivity (MS):** Mothers' ability to perceive and interpret their infant's signals accurately and then respond appropriately.

**Parental responsiveness and directiveness (PRD):** This term (i.e., *parental*) is used when *both* mothers and fathers are implicated. Encompasses both responsive and directive behaviours.

# **Abstract**

## **Background**

Parental responsiveness and directiveness, (PRD) to infants' and toddlers' communicative and exploratory acts can facilitate or limit child language development; skills which are critically important to success throughout life. The association between PRD and language development has been researched over decades, and translating this research knowledge into practice will help to reduce the rates of childhood language delay/disorder. However, it is difficult to distil the effects of PRD on child language development, due to the richness and diversity of PRD conceptualisation and measurement across the empirical research.

## **Aims and Method**

This thesis sets out to investigate the association between a specific description of PRD, *Contingent Responsiveness (CR)*, and children's language development via systematic review methodology, including two meta-analyses. In order to achieve this aim, a conceptual framework was developed, and offers a new perspective and clarity to understanding the complex PRD construct. The conceptual framework vitally informed and justified adaptations to an original systematic review protocol, enabling a meaningful systematic review of CR in relation to a variety of children's language outcomes.

## **Results**

Results from the systematic review suggest an overall moderate to strong, positive, and statistically significant association between CR and child language; results from meta-analyses indicates statistically significant associations between parents' CR and children's expressive and receptive vocabulary status (pooled effect sizes:  $SMD = .81, p = .01$ ;  $r = .22, p = .001$ , respectively), and narrative syntheses support associations between CR and early vocalizations, attention, and expressive and receptive vocabulary and syntax. Information was limited for associations with pragmatics and phonological awareness.

## **Conclusions**

This thesis provides greater confidence in the association between parental CR and children's pre-linguistic and linguistic development, based on research synthesis that was supported by a clear conceptualisation of PRD. This research can be used to inform practice and policy regarding the parent's role in facilitating children's language development.



## **Declaration**

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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Date: \_\_\_\_\_

## **Dedication**

This work is dedicated to my two children, Mia and Clara, who have endured a studying mother for most, or all of their early childhood, and my husband Michael, who has patiently supported my academic goals at the expense of time spent together, or on other aspirations. I would not have been able to complete this work if it were not for Michael's committed and unconditional support, and trusted parenting to our girls, which gave me the time and space I needed to study. Conducting research about parental responsiveness whilst doing my best to apply it on a day-to-day basis has been an interesting and insightful process. I hope that my children will be able to look back and remember mostly the warm and positive responsive interactions we have had, rather than the harsher and more directive parenting behaviours that occurred during stressful study periods! I love you, Mia and Clara, to the moon and stars and planets and back, times infinity.

## **Acknowledgements**

I would first like to sincerely thank my primary supervisor Dr David Tivey, and co-supervisors, Dr Melanie Attard and Dr Debbie James for their valuable methodological, practical, conceptual and personal support, and patience. I am grateful not only for their assistance, but also for their collegiality and friendship. I feel privileged to have had the opportunity to work with such an intelligent and kind-hearted group of mentors. I am also grateful to have been a recipient of the Australian Postgraduate Award research scholarship, which I believe to be an important initiative in supporting Australian research.

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I would also like to thank a long list of family members and friends, who have helped considerably by taking good care of my children while I took the time needed to study. In particular, those who provided repeated support: my parents, Carmen and Tony Saliba; mother-in-law, Connie Villarosa; sisters, Annette Lacar and Jennifer Young; and nieces and nephews. I am very lucky to have such an extensive and amazing support network.

## **Preface**

The idea for this thesis emerged from observations of everyday parent-child interactions, which occurred during a time of personal transition from full-time Speech Pathologist to full-time Stay-At-Home-Mother. Wearing both the Speech Pathologist and ‘new mother’ hats, I observed differences in the ways parents responded to their children in the community, and in the communicative abilities of the children. Some parents showed interest and remained fully engaged with their child, describing the child’s actions (e.g., “Put your foot up on the step”), or noticing and interpreting their child’s verbal or non-verbal bids for attention (e.g., “Oh, you want help?”), or what they showed interest in (e.g., “What are you pointing to? Oh that’s the truck.”). Other parents largely missed or ignored when their child was attempting to communicate something via sounds, words or gestures either on purpose, or because they were not tuned in to their child’s signal; and other parents demonstrated a harsh and directive tone and manner with their children (e.g., ‘No! That’s not right. Give it to me!’). These observations led me to undertake this research in order to better understand the connection between parents’ interactive behaviours with their children and subsequent speech and language development.

## **Thesis Composition and Stylistic Matters**

This thesis is presented in *thesis by publication* format and is organised into five chapters across two sections. Section One of the thesis contains Chapters One to Three. Chapter One provides the context and significance of the thesis, and briefly introduces the methodology. It limits explanation of the theoretical background purposely in order to avoid repetition throughout the thesis. Chapters Two and Three provide further information about the systematic review methodology used for the main body of research, and the constructs of maternal responsiveness and directiveness (MRD), respectively.

Section Two contains Chapters Four and Five; Chapter Four contains the main body of research – a systematic review that investigates the associations between Contingent Responsiveness (CR) and a range of child language outcomes; and Chapter Five consists of an overall discussion and conclusion.

Chapters Two to Four comprise three papers that have been submitted for publication in peer-reviewed journals; therefore, there may be variation in referencing

styles across these chapters, and there is separate pagination to the rest of the thesis. Each of these chapters is preceded by a brief contextual statement.

Some of the work undertaken in this thesis has been presented in either poster or oral format at university faculty and local and national discipline conferences for Speech Pathology and Nursing<sup>1</sup>. A formal application to a research ethics committee was not required for the work undertaken since it did not include any primary research involving animals or humans; only secondary data was utilised.

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<sup>1</sup> Saliba, M. (2012, Nov). Parental responsiveness and directiveness in relation to children's language development: A comprehensive systematic review. In *Children Communities Connections Conference*. Symposium conducted by Salisbury Communities for Children, Adelaide, Australia.

Saliba, M. (2013, Sept). Responsive parent interactions for children's language development. In *Barossa Hills Fleurieu Rural Region Nursing Allied Health Midwifery Conference*. Mt Barker, South Australia.

Saliba, M., Tivey, D., James, D. G. H., & Attard, M. (2013, Aug). Talk to me baby! Parent responses for child language development (poster). In *Faculty of Health Science Postgraduate Research Conference*. Conducted by The University of Adelaide, Adelaide, Australia.

Saliba, M., Tivey, D., James, D. G. H., & Attard, M. (2015, May). The association between parents' contingent responses and children's vocabulary development: A systematic review (poster). In *Challenge Broaden Revolutionise: Speech Pathology Australia National Conference*. Canberra, Australia.

Saliba, M., Tivey, D., James, D. G. H., & Attard, M. (2015, Aug). Parent's contingent responses predict child vocabulary development (poster). In *Faculty of Health Science Postgraduate Research Conference*. Conducted by The University of Adelaide, Adelaide, Australia.

## Section One

### Chapter 1: Context and Significance

#### Child Language Development in relation to Parental Responsiveness and Directiveness: An Overview

Imagine two infants born to two different mothers. From the beginning, one infant experiences a mother who is frequently responsive to his interests, exploration and communication attempts. The mother notices what he is engaged in and promptly responds – appropriately and contingently – in relation to his preceding behaviour. Her response may take many forms. For example, expanding on his attempts to say words, providing linguistic meaning to the objects of his focus, or asking him a question:

*Infant:* pointing to rattle, “wa”.

*Mother:* “Yes. It’s a rattle. You can shake the rattle”.

The other infant experiences less frequent responsive interactions with his mother. His mother may interact in an abrupt or harsh manner, e.g.,

*Infant:* pointing to rattle, “wa”.

*Mother:* “What!” (spoken in an impatient tone of voice);

or simply ‘miss’ opportunities to interact responsively, by not noticing, intentionally ignoring, or redirecting the infant’s communicative attempt and attention, e.g.,

*Infant:* pointing to rattle, “wa”.

*Mother:* “Here, have your milk”, said while handing infant a bottle.

She may not recognise his interests or intent, she may not know what to say or do, or she may not realise that her early interactions with him could potentially influence his development, such as the acquisition of language.

Parents’ comments and actions in response to their children’s vocal and behavioural attempts to communicate, gain attention, or share experiences, may be associated with children’s language development (Landry, Smith, Swank, & Guttentag, 2008; Masur, Flynn, & Eichorst, 2005; Nicely, Tamis-LeMonda, & Bornstein, 1999; Tamis-LeMonda, Bornstein, & Baumwell, 2001). These interactions can be described as

being *responsive* or *directive*. A parent can respond in many different ways, across and within the two distinctions of responsiveness or directiveness, dependent on characteristics such as their choice of words, vocal tone and manner (e.g., the coding of maternal responses in Landry, Smith, & Swank, 2006). The complexity of this parenting construct is reflected by the many terms and definitions used to label and describe it in the empirical literature (Chapter Three). However, there seems to be general agreement that in order to be considered responsive, parents' responses must encompass the characteristics of being prompt, contingent and appropriate in relation to the child's prior behaviour (Baumwell, Tamis-LeMonda, & Bornstein, 1997; Nathanson & Rasmussen, 2011; Paavola, 2006; Tamis-LeMonda, Bornstein, & Baumwell, 2001; Tamis-LeMonda, Bornstein, Baumwell, & Damast, 1996). Conversely, parental directiveness involves parents' attempts to supportively or intrusively control or redirect children's behaviour or attention (Masur, Flynn, & Eichorst, 2005).

The mechanism by which parental responsiveness and directiveness is thought to influence language acquisition is described in detail in Chapter Four. In brief, the research investigating associations between PRD and child language is predominantly founded in a social-interactionalist perspective of child language acquisition. This view recognises the interplay between an infant's innate capacity to learn language, and the parent's role in continually scaffolding and supporting the infant to shift their skills into the next level of development (Weiten, 1998). Accordingly, parents are seen to be in an important position for facilitating (or limiting) their children's developmental trajectory through the way they respond to their communication and behaviour, particularly from birth to three years old.

### **Significance of This Research Project**

The manner in which parents respond to their infants' and toddlers' early communicative attempts, in relation to child language development, has been the subject of many studies across varied disciplines over decades (Landry, et al., 2008; Nicely, Tamis-LeMonda, & Bornstein, 1999; Tamis-LeMonda, et al., 2001; Tamis-LeMonda, Bornstein, Baumwell, & Damast, 1996). However, this richness makes it difficult to discern the effects due to the diversity of terms and definitions of responsiveness and directiveness, the array of measurement and statistical methods, and the extensive use of observational design. The challenge is to synthesise these findings

to form a clear picture of the role of different parent responses as they relate to child language outcomes.

If possible, a synthesis of evidence will increase confidence in the outcomes of the current research evidence and assist in knowledge-to-practice transfer. If an association between early PRD and child language development is affirmed, it may support PRD as potential risk/protective factor of child language delay. Consistently high prevalence rates of childhood language delay and disorder are reported – affecting up to 20% of Australian 4-year-olds (Reilly et al., 2010; Wake et al., 2011) – and these skills are of critical importance to future literacy, social, emotional and vocational outcomes (Catts, 1993; Sheridan, Knoche, Kupzyk, Edwards, & Marvin, 2011; Walker, Greenwood, Hart, & Carta, 1994). For example, vocabulary comprehension at age three independently contributes to reading comprehension six to eight years later (Durand, Loe, Yeatman, & Feldman, 2013). Health promotion and early parent education regarding the parent's role for facilitating children's early language skills could potentially reduce the number of preschool and school-age children with communication difficulties. These and other proactive approaches could help to support parents in their role as their children's first educators, to reduce the personal, social and economic costs associated with later language delay and low literacy levels (Spedding, Harkins, Makin, & Whiteman, 2007). However, the conceptual and methodological diversity in the research makes it complicated to ascertain which types of PRD behaviours or characteristics are of most value to target in intervention or public health messages relating to promoting child language development.

One way to assist the translation of evidence into practice and policy is through systematic review methodology, which synthesises all the best evidence on a particular topic, making it easier for health professionals and policy makers to access quality information to guide their decision-making. Given associations between PRD and child language outcomes have been investigated in the primary research for decades, a systematic review was considered appropriate in order to synthesise the findings for an overall perspective on the topic; subsequently a peer-reviewed protocol was published (Saliba, 2011). Systematic reviews include the use of pre-set explicit methods to comprehensively search for, appraise and synthesise empirical evidence and minimise bias, which are documented in a transparent and reproducible way (Evans, 2001).

A systematic review examining the associations between clearly specified and defined aspects of PRD and child language development will support and direct



evidence-based practice regarding the parent's role in child language development, by increasing confidence in a unified research message. This research will also be useful in identifying areas of research gaps or excess, hence providing an informed direction for future research and effective use of resources, and importantly, informing health professionals and policy makers on the best messages to deliver to parents for enhancing responsiveness and subsequent child language outcomes.

## **Research Aim**

The purpose of this thesis is to investigate the association between PRD – specifically, *contingent responsiveness (CR); the degree or frequency of responsiveness to a child's target activities, including promptness and appropriateness of parental reactions, as well as appropriate pace that fits the child's abilities (Bornstein, Tamis-LeMonda, Hahn, & Haynes, 2008; Landry, Smith, & Swank, 2006)* – in the first three years of life, as it relates to children's language development.

## **Methodological Considerations**

Systematic review methodology is used in this thesis, to examine the associations between PRD and children's language outcomes, as it can offer a greater level of evidence than individual studies alone, particularly when meta-analyses are involved (NHMRC, 2009). In order to achieve the research aim, greater conceptual clarity regarding the PRD construct was required; a preliminary step in conducting the systematic review was to develop a conceptual framework involving the delineation of different response types within the PRD construct. This is because there is considerable variation in the way PRD is labelled, defined, and measured in the empirical research. Although an explicit, shared conceptual system is considered necessary for theory development in relation to the prediction and explanation of health behaviour (Smedslund, 2000), a PRD conceptual framework does not currently exist. The conceptual and operational diversity of PRD in primary research creates barriers to understanding and synthesising the quantitative data regarding the relationship between these parenting behaviours and child language outcomes – namely because of difficulties in combining like with like, and confusion when trying to interpret and compare research findings across different studies.

Delineating the myriad of PRD terms and definitions is a necessary requirement for proceeding with a meaningful systematic review, in order to determine whether

primary studies investigate the same, or different, parenting behaviours, prior to synthesizing quantitative results. In this thesis, the ‘problem’ of conceptual diversity is transformed into an opportunity to contribute to the field; by exploring whether a meaningful conceptual framework could be developed (Chapter Three) in order to progress towards a shared conceptual system. That is, to offer a unified way of labelling, describing and consequently, interpreting research in the field.

The conceptual framework is informed by the review and synthesis of the best available research literature on this parenting construct (in the context of its relation to child language development) through a comprehensive and systematic search strategy. The Conceptual Framework Analysis technique (Jabareen, 2009) was the chosen approach to develop the conceptual framework because it is designed specifically for complex multidisciplinary phenomena. Notably, the research informing the conceptual framework is predominantly about mothers, therefore the conceptual framework will be referred to herein as the *Maternal Responsiveness and Directiveness* (MRD) conceptual framework.

The issue of conceptual clarity is pertinent to this thesis because it necessitated a narrowing of the research questions, and description of the phenomena of interest (i.e., PRD) from the published systematic review protocol (Saliba, 2011; Appendix A) after the systematic review process had already begun. This is because the PRD construct was conceptualised in many different ways across the literature during stages of interrogating full text papers and data extraction. Subsequently a contrasting methodological perspective to the traditional view of avoiding amendments to protocols when implementing systematic reviews is presented in Chapter Two, as a research paper. It demonstrates the importance of being flexible when applying a systematic review research protocol in the area of complex social phenomenon, such as PRD. The present work highlights the value of a more iterative process involving flexibility and protocol adaptations in response to relevant, new information and opportunities when dealing with complex constructs that do not already have established conceptual frameworks.

In conclusion, within the broader aim of seeking to understand the interplay between PRD and children's language development, this thesis also provides insight into the conceptualisation of the PRD construct, via the development of a MRD<sup>2</sup> conceptual framework; and offers unique methodological considerations for developing and applying systematic review protocols to complex social phenomenon.

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<sup>2</sup> Please refer to the Glossary for definitions of PRD/MRD, or the thesis discussion section 'Limitations and Considerations' for an explanation why the terms PRD or MRD are specifically used.

## **Chapter 2: The Value of A Flexible Systematic Review Protocol**

The following chapter contains the content of the research paper:

Saliba Luppino, M., Attard, M., & Tivey, D. R. (text in manuscript). The value of flexible research protocols when systematically reviewing complex social constructs: A worked example about parental responsiveness.

This chapter provides justification and transparency as to how and why the original published systematic review protocol was modified during the implementation of the systematic review (Chapter Four). Footnotes are identified by superscript numbers and are presented at the end of the document. The original systematic review protocol (Saliba 2011) is presented in Appendix A.

# Statement of Authorship

Title of Paper	The Value of Flexible Research Protocols when Systematically Reviewing Complex Social Constructs: A Worked Example About Parental Responsiveness
Publication Status	<input checked="" type="checkbox"/> Submitted for Publication
Publication Details	Saliba Luppino, M., Tivey, D. R., & Attard, M. (submitted Jan 2016). The value of flexibly research protocols when systematically reviewing complex social constructs: A worked example about parental responsiveness. <i>International Journal of Social Research Methodology</i> .

## Principal Author

Name of Principal Author (Candidate)	Melissa Saliba Luppino
Contribution to the Paper	Conception and design; analysis and interpretation of data; writing and critically reviewing the manuscript; gave final approval of the version to be published; acted as corresponding author.
Overall percentage (%)	95%
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	Date <u>23/3/16</u>

## Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

- i. the candidate's stated contribution to the publication is accurate (as detailed above);
- ii. permission is granted for the candidate to include the publication in the thesis; and
- iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr David Tivey
Contribution to the Paper	Supervised development of work; provided guidance regarding amendments to the original systematic review protocol; helped to evaluate and edit the manuscript; gave final approval of the version to be published.
Signature	Date <u>23/3/16</u>

Name of Co-Author	Dr Melanie Attard
Contribution to the Paper	Helped to evaluate, structure, critically review and edit the manuscript; gave final approval of the version to be published.
Signature	Date <u>28/3/16</u>

## ORIGINAL ARTICLE

### **The value of flexible research protocols when systematically reviewing complex social constructs: A case example about parental responsiveness.**

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**January 2016**

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## **Abstract**

The idea that refinements to a systematic review protocol are acceptable during its implementation is explored in this paper. Firstly, a brief background on the process of systematic reviews is provided. Then using a case example, this paper illustrates the process and reasons for which refinements to an original protocol (investigating the association between parental responsiveness and directiveness and children's language development) were essential in order to produce a more meaningful systematic review, while also contributing to the conceptualization of a complex parenting phenomenon.

Keywords: systematic review, protocol, methodology, responsiveness, parent, language development

## **Introduction**

### **Aims of This Paper**

This paper challenges the notion that systematic review protocols must always aim to be definitive and unchangeable. Through a case example of a systematic review about the construct of early parental responsiveness and directiveness (PRD) and its association with children's language development<sup>1</sup>, this paper aims to illustrate: (1) the usefulness of a flexible approach to implementing a systematic review protocol, in circumstances where salient information about a phenomenon of interest may present only once the systematic review has commenced, and (2) how allowing an iterative process can aid the understanding of how complex constructs are conceptualized in the research.

### **Systematic Reviews: A Brief Overview**

Systematic reviews synthesize data from individual studies that have met predefined eligibility criteria, in order to answer specific questions about a topic of interest. By bringing together the best available evidence on a particular topic into a single document, systematic reviews make it easier for health professionals and policy makers to access pre-filtered, quality guiding research. They are a tool that supports translation of knowledge into practice and policy.

The methodological strength of a systematic review, over the traditional literature review, is in the utilization of systematic, scientific methods to provide summaries of the best available evidence about a given topic (Evans, 2001). For example, by explicating pre-set and documented methods to search for, critically appraise and synthesize the empirical evidence (Evans, 2001; Petticrew & Roberts, 2006), systematic reviews aim to limit bias in their results. To achieve this rigor, research questions, inclusion criteria and methods are set *a priori* in a peer-reviewed, published protocol, which provides a clear



direction for the review, as well as promotes the transparency of, and adherence to, the methodological process (Evans, 2001; Tricco, Tetzlaff, & Moher, 2010).

The process of conducting a systematic review can be summarized in five phases: (1) clearly documenting the research question and pre-defined study eligibility criteria in a research protocol, (2) conducting a systematic search that identifies the relevant work according to the eligibility criteria, (3) assessing the methodological quality of the identified studies, also known as critical appraisal, (4) extracting and synthesizing data from included studies, and (5) documenting the methods and interpreting the findings and documentation of methods in the review report (Evans, 2001; Higgins & Green, 2011; Khan, Kunz, Kleijnen, & Antes, 2003). As a result, systematic reviews can be considered as presenting the best available evidence on a topic because they employ a comprehensive and targeted and documented search strategy and the individual studies on which the overall findings are based have met pre-set criteria as well as been assessed on their quality and validity through the critical appraisal process. The synthesized findings can then be presented in narrative form or if appropriate, by statistically pooling data into meta-analysis. It is appropriate to conduct meta-analysis only when studies ‘address the same question, use the same population, administer the intervention in a similar manner and measure the same outcomes’ (Evans, 2001, p. 5).

### **The evolution of systematic review methodology.**

Traditionally, systematic reviews emerged as a scientific method for investigating the effectiveness of medical *interventions* by assessing the quality, and then synthesizing the results of experimental studies, largely in response to Archie Cochrane’s foundational work on evidence-based practice (Shah & Chung, 2009). His work asserted that medical decision-making be based on the best available evidence, noting the importance of critically evaluating the quality of medical research literature. Over time, it was acknowledged that some questions cannot be answered by intervention studies, and the

‘best available’ empirical evidence may be in the form of observational studies, comparative cohort studies, qualitative studies, or text and opinion (Tricco, et al., 2010). Thus, systematic review methodology has evolved and broadened, enabling the synthesis of other evidence types to answer questions beyond the effectiveness of interventions, for example, the synthesis of results from observational studies in order to answer questions about associations between variables.

### **Systematic review protocol modifications.**

It has been reported that changes to a systematic review protocol may be acceptable, provided they are justified and transparently reported in the final review (Tricco, et al., 2010). However, it is difficult to find literature that details the circumstances in which protocol modifications could be acceptable, perhaps because deviations to systematic review protocols are generally discouraged (JBI, 2014) given they evolved from an intervention-effectiveness focus. When reviewing the overall effect of an intervention, adhering to the research protocol serves to limit bias by ensuring that systematic reviewers do not make changes to their inclusion and exclusion criteria in order to influence the review’s results as they come to light.

Because the methodological rigor of a systematic review relies on the process of protocol implementation, commitment to the research protocol is generally expected (Campbell Collaboration, 2015; Higgins & Green, 2011; JBI, 2014). As systematic review methodology has broadened to include forms of research other than randomized controlled trials (RCTs), this same rigor regarding strict adherence to the protocol has been applied (JBI, 2014). However when systematic reviews are used to answer other questions, such as to assess the association between variables in the context of complex social or developmental constructs, deviations from the pre-set protocol may be a necessary part of an iterative process, and it is contended that this can ultimately add value. In support of

this notion, the present paper demonstrates how and why value-adding changes to a protocol may be made.

## **Case Example: A Systematic Review About Parental Responsiveness and Children's Language Development**

This section of the paper illustrates, through a worked example, how a published systematic review protocol required refinements during its implementation, in response to new conceptual findings that emerged once the systematic review had begun. A brief background to the topic is provided for context, followed by a description of how the original protocol was developed, as well as how and why it was modified. The advantages of proceeding with the modifications are also described.

### **Brief Background to the Topic**

Parents' comments and actions in response to their children's vocal and behavioral attempts to communicate, gain attention, or share experiences, can be described as being *responsive* or *directive*, dependent on characteristics such as the parent's choice of words, vocal tone and manner. There are many different ways a parent can respond, across and within the two distinctions of responsiveness or directiveness. The complexity of this parenting construct is reflected by the many terms and definitions used to label and describe it in the empirical literature, however there also seems to be general agreement that in order to be considered responsive, parents' responses must encompass the characteristics of being prompt, contingent and appropriate in relation to the child's prior behavior (Baumwell, Tamis-LeMonda, & Bornstein, 1997; Nathanson & Rasmussen, 2011; Paavola, Kunnari, & Moilanen, 2005; Tamis-LeMonda, Bornstein, & Baumwell, 2001; Tamis-LeMonda, Bornstein, Baumwell, & Damast, 1996). Conversely, parental directiveness involves parents' attempts to supportively or intrusively control or redirect children's behavior or attention (Masur, Flynn, & Eichorst, 2005).

Confirmed associations between parental responsiveness and directiveness (PRD) toward their infants and toddlers, and their subsequent preverbal and language development continue to emerge through primary research (Landry, Smith, Swank, & Guttentag, 2008; Nicely, Tamis-LeMonda, & Bornstein, 1999; Tamis-LeMonda, et al., 2001; Tamis-LeMonda, et al., 1996). Recent research indicates that up to 20% of Australian four-year-olds have difficulty using or understanding language (Reilly et al., 2010; Wake et al., 2011) and yet these skills are of critical importance to future literacy, social, emotional and vocational outcomes (Catts, 1993; Sheridan, Knoche, Kupzyk, Edwards, & Marvin, 2011; Walker, Greenwood, Hart, & Carta, 1994). Consequently, a systematic review protocol was devised and published in order to assess the level of association between early PRD and child language development (Saliba, 2011). A systematic review was considered an appropriate method for synthesizing the research knowledge in this field.

A large body of research exists regarding the relationship between PRD and children's language development, however, in this context, the construct of PRD is not consistently defined or measured across studies. The absence of standardized terminology or unified theoretical framework to underpin the empirical work on PRD results in diversity of terms, definitions and measurement methods across the literature. Consequently, synthesizing data pertaining to parent behaviors that had subtle or pronounced conceptual differences uncovered an issue to be addressed during the systematic review process. Neither this issue, nor its impact on research synthesis, was evident until several steps into the implementation of the published systematic review protocol.

## **Method and Results**

### **Development of the original protocol.**

The original systematic review protocol was developed in accordance with Joanna Briggs Institute (JBI) guidelines, and in keeping with the PRISMA guidelines (Preferred Reporting Items for Systematic reviews and Meta-Analysis; Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009) an *a priori* protocol was published (Saliba, 2011). Several measures were utilized in order to maximize the quality and appropriateness of the protocol including: (1) a preliminary background literature review conducted by the author who has clinical experience in the field, (2) presentation of the protocol to a panel of five people who were selected for their clinical and/or academic merit in the fields of Psychology, Speech Pathology or Translational Health Science, (3) protocol revisions based on panel feedback, and (4) publication in a peer-reviewed journal that specializes in systematic reviews.

Details of the original protocol, and subsequent modifications are found in Table 1. The original protocol sought to investigate the possible link between various aspects of PRD and stages of prelinguistic and early language development through a systematic review of quantitative evidence, as well as to detail the Australian public awareness and the policy landscape relating to procedures and guidelines in Australia through a review of available textual evidence.

Table 1

*Description of the original systematic review protocol and modifications*

	Original protocol	Modification	Reason for modification
Systematic review title	The relationship between parents' responsiveness to their infant's early communication and its subsequent growth, within the current societal context: A comprehensive systematic review.	The association between early parental contingent responsiveness and children's language development: A systematic review.	Title needed to reflect a more specific definition of parental responsiveness (contingent responsiveness) and the removal of the textual component from the original protocol (i.e., no longer considered 'comprehensive').
Research question			
Quantitative	<ol style="list-style-type: none"> <li>1. What are the attributes of parental responsiveness? That is: To delimit the attributes of parents' verbal and behavioral responsiveness and directiveness that influences children's preverbal and early communicative development.</li> <li>2. Do some attributes of parent responsiveness have more consequence to children's early communication development than others?</li> <li>3. Is the amount or frequency of parent responsiveness important? That is: Do varying levels of parent responsiveness impact differently on children's communication development?</li> <li>4. Are there parental factors (e.g. education level) within the well population that predict or influence responsiveness quality and quantity? If so, what are they?</li> </ol>	To what extent is parental contingent responsiveness towards children aged birth to three years associated with their communication development?	<p>Original protocol was too broad and asked too many questions. Became apparent following the implementation of the search strategy, which revealed large numbers of studies with large range of parent behavior types.</p> <p>Original questions not specific enough. The modified definition is more specific to the aim of identifying associations between the two variables.</p> <p>Question 1 from the original quantitative questions is in fact a qualitative question.</p> <p>Question 2 from the original quantitative questions assumes that subgroup analysis of different parent response types will occur. This question is not relevant for the modified version because only one type of operationalization and definition responsiveness was chosen.</p>
Textual	<ol style="list-style-type: none"> <li>1. Does current Australian government policy on child development reflect the research evidence identified in the quantitative component of this systematic review?</li> <li>2. What is society's current awareness and standing (perception) on this topic, as identified through policy, expert and public opinion?</li> <li>3. Are there preventative <i>universal</i> or <i>selective</i> health</li> </ol>	Removal of textual component.	The original protocol was too broad, and asked too many questions, which became apparent during the search strategy. Therefore the textual component was removed in order to narrow the project and focus the questions on the association between variables.

	Original protocol	Modification	Reason for modification
	<p>promotion measures in place relating to the review question?</p> <p>4. If the answer to question 3 is 'yes', then what are they?</p>		
Participants (P)	Parents who do not present with clinically significant risk factors (e.g., mental illness, hearing impairment) and children born full term, who are typically developing or language delayed (in the absence of co-morbidities) aged zero to 36 months or average utterance length below 2.5 morphemes (e.g., 'On box', 'My toy').	Largely unchanged. Some additional detail specifying age and level of children.	After retrieving and reading full text papers, it became apparent that studies varied in the way they described children's age/language ability, necessitating the added description of children's language stage.
Quantitative			
Textual	Discourse and opinion reported or published by government agencies, experts, the public and media, about the systematic review question, that is of direct relevance or interest to Australia.	Removed.	Too broad.
Phenomena of interest (I)	Any studies that evaluate parent verbal and behavioral responsiveness and directiveness to their children's preverbal and or early linguistic communication.	Studies were included if their definition of parental responsiveness was the same, or very close to the narrowed definition of <i>contingent responsiveness, a degree or frequency of response that is prompt, appropriate and dependent (i.e., contingent) upon a child's prior behavior</i> (Bornstein, et al., 2008; Landry, Smith, & Swank, 2006; Tamis-LeMonda, et al., 2001). Studies that defined parent behaviors at a more granular level (i.e., measured <i>specific types</i> of responses such as parents' question-asking, or labeling) or a global level (i.e., assigning one overall score that reflects parents' performance on more than one conceptually different aspect of responsiveness, such as emotional warmth <i>plus</i> labeling) were not included.	Definition needed to be narrowed for conceptual homogeneity.
Quantitative			
Textual	Published and unpublished papers that describe society's and government's current attitudes and opinions regarding the topic of parental responsiveness to infant and early communication.	Removed.	Too broad.

	Original protocol	Modification	Reason for modification
Outcomes (O)			
Quantitative	Measures of child prelinguistic and early language development. This includes, but is not limited to, measures of language milestones such as comprehension of first words, speech sound perception, babbling, first word production, first 50 words and first 2-word utterance. The process of the systematic review may reveal other important prelinguistic or early language outcomes, which may be considered for inclusion depending on the validity, reliability and standardisation of the tools used to obtain the data. The preferred type of assessment tools used to retrieve data about child language outcomes will be standardized language/communication assessments. However, parent reports and non-standardized assessments will also be considered for inclusion.	Outcomes relating to children's prelinguistic development (e.g., early vocalizations, attention, pointing), sound awareness (i.e., phonology), receptive and expressive vocabulary, or receptive and expressive syntax.	Same outcomes, but clearer wording.
Textual	Discourse and opinion about the topic of parental responsiveness and children's communication development, as reported in textual or policy papers. The outcome will be the main themes and concepts identified through expert and society opinions, and government policy, in relation to the review question.	Removed	Too broad.
Studies (S)			
Quantitative	Quantitative: Randomized control studies, quasi-randomized trials and quasi-experimental prospective and analytical observational studies including retrospective cohort studies, case control studies and analytical cross sectional studies.	Unchanged	-
Textual	Expert opinion, discussion papers, position papers, government policies and reports, conference papers, theses and dissertations, and other text relating to child development/health promotion/early education within the context and parameters of the review question.	Removed	Too broad.



## **The iterative process of protocol implementation and modification.**

Following the implementation of several steps review of quantitative evidence, including the search strategy, examination of title and abstract, and full text examination, the conceptual differences for PRD, as evidenced by a variety of terms and definitions across more than 80 quality studies, became apparent. The new, in-depth knowledge about the complexity of the PRD topic that was came to light during the implementation phase led to re-evaluating the details of the original protocol. In order to produce meaningful outcomes from data synthesis, PRD data needed to be clustered into conceptually similar groupings for a more robust assessment of its impact on language development, as opposed to proceeding with synthesis of data from conceptually heterogeneous sources. It was determined that this was best addressed by including an additional step in the process, which involved developing and utilizing a coding system informed by the new qualitative information and existing theories in the literature (Bornstein, Tamis-LeMonda, Hahn, & Haynes, 2008; Landry, Smith, & Swank, 2003; Tamis-LeMonda, Bornstein, & Baumwell, 2001). The coding system aided categorization of PRD terms and definitions extracted from the included studies into a conceptual framework (detailed explanation of the framework is beyond the scope of this paper)<sup>2</sup>. This also resulted in a contribution to the field by way of a PRD conceptual framework, which was otherwise lacking. Importantly, this also enabled the systematic review to focus on a narrower definition within the PRD construct (called *contingent responsiveness*), which was selected from the framework, thus enabling homogeneity in the dataset.

In light of the increased focus on the conceptualization of the PRD construct, the protocol was narrowed by removing the textual component of the systematic review.<sup>3</sup> The protocol's research questions and outcomes, as well as the systematic review's title were also re-worded in order to reflect the refinements. The details and reasons for the modifications are further explained in Table 1.

## Discussion

This paper challenges the methodological rigidity of adhering to pre-set systematic review protocols that involve conceptually complex phenomena, by using a practical example to illustrate how deviations from a protocol can be an acceptable and valuable part of a transparent, iterative process. The protocol example provided in this paper relates to the topic of PRD. Once the systematic review process had begun, and more detailed examination of the research occurred, this topic was found to be somewhat more complex than anticipated; both narratively and statistically pooling data became problematic due to variance in studies. Although steps had been taken to develop an appropriate peer-reviewed protocol, the subtle conceptual differences within the phenomenon of interest were not identified through the preliminary literature search nor in the protocol panel defence. It was not until detailed examination of full text papers – literature retrieved based on formal database search and examination of titles and abstracts – that the conceptual differences became apparent, highlighting that the way in which the data would be organized according to PRD similarities could not have been known prior to protocol development. Subsequently this paper has illustrated how refinements to a protocol, informed by new conceptual information discovered during the implementation phase of the systematic review, may be required.

While changes to a systematic review protocol should be avoided when examining treatment effects so as not to influence the outcomes of the review, in the case of examining complex social constructs, such as PRD, an iterative process that allows new information (obtained during protocol implementation) to inform the direction of the review is likely to be of more benefit than harm.

The information in this paper can aid the prospective systematic reviewer by: (1) raising awareness that conceptual diversity of complex social constructs across empirical research presents an issue for data synthesis, possibly necessitating an additional step of implementing a coding system and (2) demonstrating an acceptable process of deviation

from an original systematic review protocol. This paper supports systematic reviewers to pre-empt this kind of methodological issue when developing systematic review protocols of a similar nature and provides an approach on how to respond.

## **Advantages to Protocol Deviation**

Several benefits resulted from the flexible approach to refining the systematic review protocol based on new conceptual knowledge gained through the implementation of the first steps of the review. The most pertinent finding during the iterative process was regarding the variability of PRD terms and definitions used across primary research, which unveiled an opportunity to contribute conceptual clarity to the field through development of a coding procedure and conceptual framework. Although it is not common practice to implement coding systems in systematic reviews to organize and classify study findings, it is not unprecedented (Godfrey, Harrison, Graham, & Ross-White, 2010; Singh, 2013; Smedslund, 2000; van IJzendoorn, Dijkstra, & Bus, 1995). In fact, a JBI systematic review concluded that use of theoretical models and frameworks to guide the process of evidence synthesis “strengthens the rigor and transparency of the integrative method” (Godfrey, et al., 2010, p. 731). In the case example provided, the additional step of coding conceptual definitions arose as a consequence of a deeper understanding and closeness to the topic, gained at the point of data extraction and synthesis. This was not foreseen at the commencement of the study, despite prior reading on the topic, therefore was not accounted for in the original protocol. Had the original protocol been strictly adhered to, the opportunity to add clarity to the unclassified construct of PRD by delineating different categories of behaviors within a conceptual framework would not have occurred. Modifying the protocol enabled the application of a coding system to group variations of definitions found in the literature. This has added new information to the field by way of a newly developed conceptual framework, which is based on how the construct is currently reported in the literature. In turn, this offers a new solution, by way of a conceptual tool,

for researchers to be more unified in the way they conceptualize the PRD construct in future research.

The coding system was also deemed a necessary additional step for organizing the data obtained from the literature according to conceptual similarities. In other words, making sure that a correlation between PRD and child language outcome was pooled for data synthesis with other correlations that came from the same type of parent behavior (based on the same definition). If protocol modifications were not made, the alternative scenario to using the coding procedure and making refinements to the research question and phenomenon of interest would have been to combine data from studies that were examining conceptually dissimilar (i.e., different types of) parent behaviors. As a result of the coding system and protocol refinements, a clearer, more specific definition of the phenomenon of interest was utilized, thus the reader can be confident that the systematic review results reflect the specific parent behavior examined, rather than a combination of heterogeneous behaviors. In other words, the resultant review was narrower in its criteria in order to offer more clinically meaningful results.

## **Conclusion**

This paper shows that deviations from pre-set systematic review protocols can be a necessary, justifiable and value-adding part of an iterative research process, with resultant benefits to the field that extend beyond the systematic review results alone. It is advised that researchers undertaking systematic reviews involving conceptually complex phenomenon be aware of the potential need for protocol refinements, such as development and use of a coding procedure, as additional complexities of the phenomenon may emerge during protocol implementation. Provided the reasons for the deviations are transparent and enable a more meaningful review, as opposed to the purpose of biasing the outcomes of a systematic review in a desired direction, protocol refinements to accommodate new conceptual information are worthy of consideration and, indeed, may be required.

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## **Footnotes**

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<sup>1</sup> The systematic review has been submitted to a journal for publication. The first author can be contacted for further details.

<sup>2</sup> A paper about the conceptual framework has been submitted to a journal for publication. The first author can be contacted for further details.

<sup>3</sup> The review of textual evidence can still be pursued but it was not in the scope of the research degree undertaken by the first author due to time constraints.

## **Chapter 3: A Conceptual Framework for Maternal Responsiveness and Directiveness**

The following chapter contains the content of the research paper:

Saliba Luppino, M., James, D. H., & Tivey, D. R. (text in manuscript). Towards a conceptual framework for the constructs of maternal responsiveness/directiveness.

This chapter provides a detailed conceptual background to the constructs of PRD, and presents a conceptual framework. The list of studies of which data was extracted from, can be found in Appendix B of the Thesis. Footnotes are identified by superscript numbers and references to appendices within this chapter are located at the end of the chapter.

# Statement of Authorship

Title of Paper	Towards a Conceptual Framework for the Constructs of Maternal Responsiveness and Directiveness
Publication Status	<input checked="" type="checkbox"/> Submitted for Publication
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## Principal Author

Name of Principal Author (Candidate)	Melissa Saliba Luppino	
Contribution to the Paper	Conception and design (conceptualised the topic, developed the coding system and conceptual framework); analysis and interpretation of data (extracted the data, coded data into the framework, interpreted results); writing and critically reviewing the manuscript; gave final approval of the version to be published; acted as corresponding author.	
Overall percentage (%)	95%	
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.	
Signature	Date	23/3/16

## Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:  
 the candidate's stated contribution to the publication is accurate (as detailed above);  
 permission is granted for the candidate to include the publication in the thesis; and  
 the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr Deborah James	
Contribution to the Paper	Conception and design/analysis and interpretation of data (helped to clarify conceptual coding issues and conduct coding reliability checks); helped to evaluate, critically review, structure and edit the manuscript; gave final approval of the version to be published.	
Signature	Date	

Name of Co-Author	Dr David Tivey	
Contribution to the Paper	Conception and design/analysis and interpretation of data (supervised development of work, helped to clarify coding challenges); helped to evaluate and edit the manuscript; gave final approval of the version to be published.	
Signature	Date	23/3/16

## ORIGINAL ARTICLE

### **Towards a conceptual framework for the constructs of maternal responsiveness/directiveness**

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## **Abstract**

The way mothers respond to – maternal responsiveness – and direct – directiveness – their infants seems to be important in shaping children’s developmental trajectories. However these terms are variably described in the literature, which both attests to the richness and complexity of these concepts, and also makes translation of research into practice difficult. The aim of this paper is to propose a conceptual framework for maternal responsiveness and directiveness, as a valuable starting point to unifying the way they are conceptualized in research. A comprehensive background is presented about how these concepts are currently conceptualized, out of which, a conceptual framework is derived. Grounded in existing theories from the literature, and informed by the analysis of 279 definitions extracted from 82 studies that were located through a systematic review, the framework was developed through an iterative process. The new framework consists of four main groupings and nine sub-groupings of maternal behavior: 1) Contingent Responsiveness; 2) Emotional Support (further categorized into Intrusiveness, Verbal Encouragement/Affirmations, and Warmth/Positive Affect); 3) Language Input (further categorized into Verbal Scaffolding, Questions, Imitations/Expansions, and Labeling/Descriptions); and 4) Focus of Attention (further categorized into Maintaining and Redirecting).

## Introduction

The way mothers respond to and direct their infants seems to be important in shaping children's developmental trajectories. Maternal responsiveness and directiveness (MR/MD) in the first years of life, as it relates to children's language outcomes, have been examined from a range of perspectives and disciplines. The apparent absence of standardized terminology underpinning the empirical work on MR and MD appears to result in a diversity of terms, definitions and measurement methods across the literature. Researchers in the field have acknowledged this issue (Bornstein, Tamis-LeMonda, Hahn, & Haynes, 2008; Paavola, 2006) and appears to result in the following issues: (1) that the same MR or MD behaviors are labelled differently across studies; (2) that mothers' behaviors are labelled using similar terminology across studies, even though they are referring to different maternal behaviors when definitions are examined in more detail; and (3) that a range of MR and/or MD behaviors are bundled together into combined or global measures. Adding to the confusion of defining MR is the existence of another closely related construct, *maternal sensitivity (MS)*.

## Responsiveness

Many definitions of MR appear in the literature and these seem to stem from pioneering work of Mary Ainsworth and colleagues (Ainsworth, Bell, & Stayton, 1974). Their original definition (for MS) in the context of infant-mother attachment, described a mother's ability to perceive and interpret her infant's signals accurately and then respond appropriately. One adaptation of this definition views responsiveness in the context of parenting whereby it captures "mothers' prompt, contingent, and appropriate responses to children's behaviors" (Bornstein & Tamis-LeMonda, 1989, p. 50). The characteristics of promptness, contingency and appropriateness are considered as a "minimally necessary and sufficient definition of responsiveness" (Bornstein, et al., 2008, p. 867).

Responsiveness can be viewed as a “multidimensional, modular and specific set of behaviors” (Bornstein, et al., 2008, p. 868) with an internal structure of categories, or elements. The elements within the internal structure describe different types of maternal behaviors in response to different child activities. For example, Bornstein and colleagues (2008) observed *affirmations, imitations, descriptions, questions, play prompts, and exploratory prompts* across 40 mother-child dyads during natural home-based play. They specifically investigated verbal response types relating to the mother’s provision of language models, while other researchers, such as Landry, Smith and Swank (2006), consider maternal behaviors extending beyond spoken response types as elements of responsiveness, such as responsiveness relating to emotional support and the child’s focus of attention. For example, Landry, Smith and Swank (2006) include mothers’ emotional tone, facial expressions, levels of enthusiasm and interest, and whether a mother follows or redirects their child’s focus of attention as elements of the maternal responsiveness construct.

Alternatively, MR and MD can be measured as a monistic maternal trait, which is defined by a broad set of behaviors (e.g., Gould, 2010; Hirsh-Pasek & Burchinal, 2006; Rafferty, Griffin, & Lodise, 2011). This view combines several parenting characteristics in an overall description, and assigns a general name and/or a global measure. This approach assumes that MR or MD can be viewed as a unified whole, in which all, or groups of behaviors can be ascribed to. In other words, overall responsiveness can be computed from combining data from two or more separate parenting variables. For example, combining results from three parenting variable variables: *affective warmth* (defined as, “expressing mainly positive affect and supportive vocalizations”), *sensitivity* (defined as, “providing the infant with an appropriate level of stimulation”) and *leading* (defined as, taking the lead in interactions, regardless of the infants’ actions” into an overall responsiveness variable (Karrass & Braungart-Rieker, 2003, p. 9).

## **Sensitivity vs responsiveness.**

The terms responsiveness and sensitivity seem to be used interchangeably in the literature, or can be embedded within the definition of the other. Ainsworth and colleagues' original definition of MS (Ainsworth, et al., 1974) has evolved over time, however the characteristics of promptness, appropriateness and contingency appear to have remained central to defining a mother's verbalisation or behavior as sensitive (Ainsworth 1971, 1974 and 1978 in Lohaus, Keller, Ball, Voelker, & Elben, 2004; Shin, Park, Ryu, & Seomun, 2008). Promptness, appropriateness and contingency are also considered core characteristics of responsiveness (Bornstein & Tamis-LeMonda, 1989; Bornstein, et al., 2008). This may be one explanation as to why the terms *sensitivity* and *responsiveness* are frequently undifferentiated. For example, a definition of MS, such as "maternal behaviors that are contingent on the infant's prior behavior, timely and appropriate" (Biringen et al., 2000 in Shin, et al., 2008, p. 306) is almost identical to a definition of MR; "mothers' prompt, contingent, and appropriate (not simply contiguous) behaviors" (Bornstein & Tamis-LeMonda, 1989, p. 50). Researchers have acknowledged that the terms *sensitivity* and *responsiveness* are often used interchangeably across the literature (De Wolff & van IJzendoorn, 1997; Paavola, 2006; Shin, et al., 2008).

Despite the apparent similarities, maternal sensitivity is reported to differ to MR because it focuses on the quality or appropriateness of mothers' behaviors, whereas responsiveness focuses on a count or the quantity of mothers' responses in relation to frequency or promptness (De Wolff & van IJzendoorn, 1997; Meins et al., 2001 in Shin, et al., 2008). However in reality, MR conflates both MR and MS because to measure frequency involves judging quality. Although MR behaviors are commonly measured through a frequency count or scale, its operationalization inherently incorporates the *appropriateness* of mothers' behaviors, given appropriateness is considered a core component of the responsiveness definition. In addition, several studies do acknowledge qualitative differences of MR behaviors by examining separate types of responsive



behaviors, rather than grouping all responsive behaviors as one and providing an overall frequency count (Girolametto et al., 2002; Lacroix, Pomerleau, & Malcuit, 2002; Paavola, Kunnari, Moilanen, & Lehtihalmes, 2005; Tamis-LeMonda, Bornstein, & Baumwell, 2001; Vigil, Hodges, & Klee, 2005).

Further, MS relates to infants' mental states whereas MR relates to infants' physical and/or emotional needs (Fonagy et al., 1994 in Shin et al., 2008). However, measurements of MS can incorporate features relating to emotional states (Bornstein, Hendricks, Haynes, & Painter, 2007). Also, MR can be operationalized in response to infants' mental states. For example, a mother is being responsive to, and inferring their infant's mental state when they *label* or *describe* an object of their infant's attention ("That's a rattle") or comment on their child's actions ("You are reaching for the rattle. Do you want the rattle?").

Another point of confusion between the concepts of MS and MR is that responsiveness is an attribute of sensitivity or embedded in sensitivity (Page, Wilhelm, Gamble, & Card, 2010; Bohlin et al., 1989 in Shin, et al., 2008). For example, MS may include both "verbal and nonverbal behaviors that are responsive and contingent in nature" (Page, et al., 2010, p. 102). Conversely, a mother must be sensitive to the child's signals in order to be responsive (Landry, Smith, Swank, & Guttentag, 2008).

## **Directiveness**

Maternal directiveness captures mothers' attempts to supportively, or intrusively, control or redirect children's behavior or attention (Masur, Flynn, & Eichorst, 2005). Mother's intentions may account for distinctions between different types of directive behaviors. That is, whether the directive behavior is supportive or intrusive (Baumwell, et al., 1997; Masur, et al., 2005), and whether or not it follows or redirects the child's current attentional focus (Landry, et al., 2006; Smith, Landry, & Swank, 2005; Tomasello & Todd, 1983). For example, a maternal behavior that encourages and maintains a child's

engagement with a shape-sorting activity by saying, “put the square in the hole”, could be seen as directive because of telling the child what to do. However, it also maintains the child’s focus and thus, could meet the essential MR qualities of being prompt, appropriate and contingent. The same utterance spoken in a harsh voice tone could imply a different meaning and be seen as intrusive. Similarly, a mother’s utterance such as, “That’s enough!” could be construed as intrusive or directive if spoken in a firm or angry voice, but be an appropriate language model if the tone is pleasant and relevant to the child’s activity.

Mothers may need to be directive for safety reasons, such as yelling ‘Stop!’ in a firm tone of voice, to a young child about to touch a hot stove, or mothers “may use directiveness as an adaptive strategy to promote joint action, attention, and interaction” (Girolametto, 1995, p. 104) such as helping an unfocused child to attend. It is possible that under some circumstances, certain types of directive behaviors may still be responsive because they meet the essential MR characteristics of being prompt, appropriate and contingent.

However, it has been suggested that MD is often viewed with negative connotations in regard to its impact on children’s developmental outcomes and its relation to MR or MS (Marfo, 1992; Pine, 1992). Undoubtedly, the language that frequently describes the concepts of directiveness, and particularly, intrusiveness, imply negative meaning, for example: discouraged (Baumwell, Tamis-LeMonda, & Bornstein, 1997); overcontrolling, overinvolved, negative regard, rejects angrily (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004); harshness, scolding, physically restraining, slapped or spanked (Rafferty, Griffin, & Lodise, 2011); physical punishments, spanking, slapping (Steelman, Assel, Swank, Smith, & Landry, 2002); displays anger, annoyance, criticism, forces, restricts, non-empathetic, punishes, threatens (Taylor & Zubrick, 2009). Also supporting the negative view are findings that show inverse relationships between MD-type behaviors and child outcomes. For example, the inverse association found between mothers’ and

fathers' negative regard, intrusiveness and detachment with concurrent child outcomes on the Mental Developmental Index (MDI) and Peabody-Picture Vocabulary Test (PPVT) at 24 and 36 months old and predictive child outcomes at 36 months<sup>1</sup> (Tamis-LeMonda et al., 2004).

Maternal directiveness may also be viewed as a single concept, comprising a range of undifferentiated directive behaviors. Through their research, Marfo (1992) and Pine (1992) challenged existing negative and monistic notions about MD by exploring associations between different types of MD behaviors and measures of MR or sensitivity. Two types of 'negative' behaviors (*directiveness* and *intrusiveness*) were inversely related to each other in a sample of 25 mother-child dyads (Marfo, 1992). In his study, directiveness was defined as, "the extent to which the mother uses hints, requests, commands, and other controlling behaviors or actions to get the child to do what she wishes and follow her lead...[sic]" (p. 224) and intrusiveness was defined as, "the extent to which the mother initiates, intervenes, or elaborates so abruptly as to disrupt the child's ongoing behavior and initiative...[sic]" (p. 224). Only intrusiveness showed a relationship (inverse) with a cluster of highly interrelated behaviors typically perceived as sensitive (sensitivity, responsiveness, elaborativeness, warmth and wait time). Thus it appears from this study that intrusiveness is less compatible with emotionally attuned aspects of maternal behavior than directiveness, and directiveness can occur independently of mothers' levels of sensitivity or responsiveness.

Similarly, Pine (1992) found that *behavioral directives* could occur independently of levels of MR. Behavioral directives are, "utterances which elicit or constrain the physical behavior of the child by commanding, requesting or encouraging the child to do or desist from doing something (e.g., 'Put the red one in'; Why don't you go and get it'...[sic]" (p. 175). Pine also noted *attentional directives* – "utterances, including

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<sup>1</sup> Intrusiveness defined as: "the parent is over-controlling and over-involved" (p. 1810); detachment defined as: "the parent is under-involved and lacks awareness, attention and engagement" (p.1810); and negative regard defined as: "the parent appears discontented and rejects the child angrily" (p. 1810).

vocatives, which seek to attract, direct or redirect the child's attention (e.g., 'Look at that'; 'See that there')" (p. 176) had a statistically significant, negative association with mothers' responsiveness (i.e., the more attentional directives, the lower the levels of MR), and were unrelated to behavioral directives. The latter suggests attentional and behavioral directives are two different phenomena. Studies such as these can help to shed light on distinctions between different types of directive maternal behaviors, and thus, how to view them within a conceptual framework.

### **Different Term For the Same Behavior**

It seems that one type of maternal response can be called many different names. For example, the behavior, *labeling* or *describing*, whereby *mothers label or describe objects, events or activity in the child's immediate environment* (Bornstein, et al., 2008) is also referred to by at least seven other names. These include: *sensitive vocalization* (Dewey, 2012); *responsive labeling with joint attention* (Girolametto, et al., 2002); *follow descriptions* (Masur, et al., 2005); *verbal labels* (Namy & Nolan, 2004); *descriptions* (Hampson & Nelson, 1993; Nathanson & Rasmussen, 2011; Paavola, Kunnari, & Moilanen, 2005; Tamis-LeMonda, et al., 2001); *comments that encode a child's activity* (Yoder & Kaiser, 1989); *descriptives* (Pine, 1994; Vigil, et al., 2005) and *labeling* (Landry, et al., 2006; Vigil, et al., 2005) to name a few. Similarly, the same pattern can be said for other types of maternal behaviors across the research.

### **Different Behaviors Included Under Similar Composite Terms**

By contrast, similar terminology seems to be used to group disparate maternal behaviors. For example, Rafferty et al, (2011, p. 233) used the composite term *emotional responsivity* to include: mothers' spontaneous vocalizations; verbal response to child's vocalizations; naming objects/people; spontaneous praise; positive tone of voice; warm physical affection, and positive response to praise towards child from others. Not only does

this term refer to *emotional* responses to a child (warmth, positive affect, encouragement and praise), it includes aspects of verbal responsiveness (labeling objects and general verbal responses). Terms used by other researchers to label composite behaviors sound similar to Rafferty and colleagues' – *responsivity/sensitivity* (Garstein et al, 2008); *maternal warm responsiveness* (Landry, Smith, & Swank, 2003; Steelman, et al., 2002); or *maternal expressed affect* (Alston & James-Roberts, 2005) – however they encapsulate different sets of parent behaviors.

This issue appears to be influenced by the assessment tool used for observing and rating maternal behaviors, particularly when tools view responsiveness as a global or composite trait. Several tools elicit composite scores for the term *sensitivity* based on a collection of maternal behaviors consisting of emotionally- and/or verbally-related maternal responses to their child. For example, studies use the same term, *sensitivity* or *maternal sensitivity* as the label for a composite score that covers different parent behaviors, based on using tools such as: The National Institute of Child Health and Human Development (NICHD) Early Child Care Research Network (ECCRN; Barnett, Gustafsson, Deng, Mills-Koonce, & Cox, 2012; Belsky & Fearon, 2002; Hirsh-Pasek & Burchinal, 2006; Leigh, Angela Nievar, & Nathans, 2011; NICHD, 1999); MULTI-PASS (Marfo, 1992; Roberts, Jurgens, & Burchinal, 2005); the Home Observation for Measurement of the Environment Inventory (HOME; Caldwell & Bradley, 1984); and the Crawley and Spiker Mother-Child Rating Scales (Crawley & Spiker, 1983 in Murray & Hornbaker, 1997).

## **Research Aims**

It is problematic that a conceptual framework for MR/MD does not exist for researchers to refer to, when articulating which aspects of responsiveness or directiveness they investigate. The differences in theoretical orientations and terminology for MR/MD compromise translating the research evidence into practice and therefore, evidence based

practice as well. Knowledge transfer may be enhanced with the formulation of a conceptual framework. The aim of this study is to develop such a framework.

It is no doubt a complex phenomenon to tackle. However, greater clarity about the MR/MD construct (including a possible internal structure) presented as a conceptual framework could help to mitigate the aforementioned issues by providing unified terms and definitions for researchers to use when describing and labeling the parenting behaviors they are investigating. A conceptual framework for the phenomena of MR/MD would provide “a shared language for researchers to clarify, design, undertake and conclude their research” (Leshem & Trafford, 2007, p. 100).

The purpose of this article is to address the need for conceptual clarity for how the MR/MD construct is utilized in research, and offer a preliminary framework. By proposing a conceptual framework this research contributes to the progression towards a shared conceptual system for the complex phenomena of MR/MD. The perspective that the MR/MD constructs consist of an internal structure is adopted.

## **Method**

This study is part of a larger systematic review investigating the association between early MR/MD and children’s language outcomes (authorship masked for blinding). The need for a conceptual framework became evident while implementing the systematic review, because of conceptual diversity. The eligible 82 quantitative studies located from 15 scientific databases<sup>2</sup> yielded 279 definitions of MR and MD.<sup>3</sup> The variation in the terms and definitions was so great, precluding synthesis of statistical data. This necessitated the design of a conceptual framework and coding system as a tool to

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<sup>2</sup> PubMed, PsychINFO, CINAHL, Embase, ERIC (ProQuest), Cochrane Database of Systematic Reviews, Campbell Collaboration, SCOPUS, Web of Science, ProQuest Linguistics and Language Behavior Abstracts (LLBA), Mednar, ProQuest Dissertations and Theses, ProQuest Sociological Abstracts, Networked Digital Library of Theses and Dissertations (NDLTD), and Electronic Theses Online Services (EThOS).

<sup>3</sup> The first author can be contacted for further information about the 82 studies and 279 definitions.

allocate extracted definitions of mothers' responsive or directive behaviors into clearly defined, conceptually similar categories.

## **Conceptual Framework Analysis**

Conceptual frameworks are: “[sic] the researcher’s map of the territory being investigated” (Miles & Huberman, 1984, p. 33); an explanation “either graphically or in narrative form, of the main things to be studied- the key factors, concepts, or variables- and the presumed relationships among them” (cited in Maxwell, 2005, p. 33); and “a network, or ‘a plane’ of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena” (Jabareen, 2009, p. 51). Conceptual frameworks enhance understanding by incorporating key sources of existing theories and research into a structure that is created, or constructed through a process of qualitative analysis (Jabareen, 2009; Maxwell, 2005). Personal technical knowledge, research background and personal experiences can also be a source of information leading to the structure of a conceptual framework (Maxwell, 2005).

The MR/MD conceptual framework was developed using *Conceptual framework analysis* (Jabareen, 2009, p. 49). This qualitative, eight-phase technique “aims to generate, identify, and trace a phenomenon’s major concepts, which together constitute its theoretical framework” (p. 53). The process is grounded theory method, which aims to discover theory through systematically sourced data, using “coding paradigms to ensure conceptual development” (p. 52). Grounded theory method involves an iterative process of deduction and induction to determine the categories within the conceptual framework (Berg, 2001; Jabareen, 2009).

The MR/MD framework was informed by: Baumwell et al., (1997), Bornstein and Tamis-LeMonda (1989), Landry et al., (2003), Tamis-LeMonda, Bornstein, Baumwell, and Damast (1996); the first author’s clinical experience; and the approximate 300 articles that were selected for full text examination from the systematic review (including the

aforementioned 82 papers). The methods for developing the MR/MD conceptual framework, in line with Jabareen's eight phases, are summarized in Table 1, and described as follows.

### **Phase 1: mapping selected data.**

A comprehensive search process to locate existing MR/MD theories and conceptual frameworks involved: (1) scanning 7113 titles (and abstracts where necessary), which were retrieved from a systematic review search conducted by the same authors (Saliba Luppino, Tivey, James, & Attard, 2016; for eligibility criteria see Appendix A). Logic grids with key words categorized into one of four areas (language development, parents, infant, and responsiveness) were tailored to search 15 databases from their inception to January 2013 (see Appendix B for example); (2) conducting searches on Google, Google Scholar, Pubmed and PsycInfo specifically on terms relating to MR, MD *and* conceptual frameworks. Step three was performed in order to broaden the search for an established MR/MD framework beyond the eligibility criteria that governed the systematic review search.

### **Phase 2: extensive reading and categorizing of selected data.**

Over 300 published and unpublished full-text papers retrieved from the systematic review search were read. Eighty-two papers passed critical appraisal of methodological quality, as part of the process for the larger study. Data represented disciplines of Linguistics, Psychology and Speech Pathology.



Table 1

*Description of Method in Relation to Jabareen's Phases of Conceptual Framework Analysis*

Jabareen's phases	Brief description of Jabareen's phases	How Jabareen's phases were applied for this research
Phase 1 Mapping the selected data	Comprehensive data collection. Recommend multidisciplinary texts, empirical research, interviews with professionals.	Comprehensive search of multiple scientific databases. Examined multidisciplinary textbooks, empirical research, and commentaries/opinion articles.
Phase 2 Extensive reading and categorizing of selected data	Aim is to read selected data and categorize by scale of importance and representative power within each discipline (the focus is ensuring representation of multidisciplinary data).	Extensive reading of selected papers. Critical appraisal occurred (i.e., focus is on categorizing by methodological quality) as part of the process relating to another body of work (citation masked for blinding). Data mostly represented disciplines of linguistics, psychology and speech pathology.
Phase 3 Identifying and naming concepts	Aim to read and re-read selected data and discover concepts.	Reading and re-reading papers. Extraction of definitions of responsiveness and directiveness (i.e., discovering concepts).
Phase 4 Deconstructing and categorizing the concepts	Aim is to deconstruct each concept- identifying main attributes, characteristics, assumptions, and role. Subsequently, to organize concepts according to their features and roles.	Extraction of definitions and terms of responsiveness and directiveness Exploring the use of pre-existing frameworks as a starting point for categorization
Phase 5 Integrating concepts	Aim is to integrate and group together concepts that have similarities to one new concept. Reduces number of concepts drastically to a reasonable number of concepts.	Coding the complete list of terms and accompanying definitions of maternal responsiveness ( $N = 311$ ) into a smaller number of categories, based on similarities of definitions.
Phase 6 Synthesis, resynthesis, and making it all makes sense	Aim is to synthesize into a theoretical framework. Iterative process and includes synthesis and resynthesis until researcher recognizes a general theoretical framework that makes sense.	Process of conceptualization using concepts maps Result is conceptual framework (Figure 1 and Table 2).
Phase 7 Validating the conceptual framework	Does the proposed framework make sense to other scholars and practitioners other than the researcher? Methods include presenting to conference or seminars.	The conceptual framework was presented to a group of speech pathologists from a South Australian metropolitan community health service. They provided positive feedback. It has also been presented in poster format at several multidisciplinary conferences (Faculty of Health Science, Midwifery and Nursing).
Phase 8 Rethinking the conceptual framework	Frameworks representing multidisciplinary phenomenon will always be dynamic. May be revised according to new insights, comments, literature etc.	The present publication of this research is a starting point for comments, insights etc. An area for future research

*Note.* Information in columns titled, *Jabareen's phases* and *Brief description of Jabareen's phases* come directly from Jabareen (2009, pp. 53-55).

### **Phase 3: identifying and naming concepts.**

All of the 82 quality approved papers were “read and re-read” (Jabareen, 2009, p. 54) to identify the terms and definitions of responsive and/or directive behaviors. These were extracted and entered into a spreadsheet as raw data.

### **Phase 4: deconstructing and categorizing the concepts.**

The extracted definitions from phase three were interrogated for their main attributes and characteristics. The similarities and differences noted across the definitions informed potential categories of maternal responsive and directive behaviors. In line with a deductive approach, the categorical schema from sound existing theory discovered during the implementation of Phases 1 to 3 (Baumwell, et al., 1997; Bornstein, et al., 2008; Landry, et al., 2006; Smith, et al., 2005; Tamis-LeMonda, et al., 2001), were also used to inform the initial structure of the MR/MD framework.

#### ***Existing theory.***

Two predominant existing systems for defining maternal behaviors were found to be the most comprehensive when it came to considering multiple aspects of MR and MD response types (Landry, et al., 2006; Tamis-Le Monda, et al., 2001). Both approaches have been utilized in multiple studies, and have demonstrated good inter-rater reliability when used for coding maternal behaviors towards infants and toddlers. One approach that was utilized in several studies (Landry, et al., 2006; Landry, Smith, Swank, & Miller-Loncar, 2000; Smith, et al., 2005; Smith et al., 1996) is clearly described in a randomized control study of responsive parenting behaviors (Landry, et al., 2006). A full account of their original definitions can be found in Appendix C. In brief, their coding system covered aspects of maternal behaviors associated with *emotional support* (positive affect, warm sensitivity, restrictiveness, physical intrusiveness and harsh voice tone), the child’s *focus of attention* (maintaining and redirecting), and the *quality of language* provided by the mother (verbal scaffolding, labeling

and verbal encouragement). They also had a specific category called *contingent responsiveness* that measured the overall degree (by 5-point rating scale) of the mother's responsiveness, and included the core aspects of promptness, appropriateness and contingency, in its definition.

The other approach, which appears in several research papers (Baumwell, et al., 1997; Bornstein & Tamis-LeMonda, 1989; Bornstein, et al., 2008; Bornstein et al., 1992; Tamis-LeMonda, et al., 2001), is described in detail by Tamis-LeMonda and colleagues (2001) in their study about the association between maternal responsiveness and children's language milestones (Appendix D). As with the former approach, this approach first makes it clear that in order to be considered responsive, a maternal response must reflect the features of promptness, contingency and appropriateness, in relation to the child's activity. The maternal behaviors are then categorized according to their language input, referred to as a *response type*. There are six response types: affirmations, imitations/expansions, descriptions, questions, play prompts, and exploratory prompts. There is also a specific category called *frequency of maternal responses*, which, similarly to Landry and colleague's (2006) *contingent responsiveness*, is an overall degree (measured by frequency count) of maternal responsiveness. A longitudinal analysis of 40 mother-child dyads supports the use of this system for categorizing maternal behaviors (Bornstein, et al., 2008). Baumwell and colleagues (1997) extend their conceptualization of behaviors to the perspective of how mothers follow or direct their child's attention.

### **Phase 5: integrating concepts.**

The extracted definitions (and corresponding terms) of maternal behaviors were integrated into the initial framework by the first author. This was achieved by allocating definitions that described similar concepts into pre-defined categories. The pre-defined categories were based on the themes that emerged from the synthesis of the existing theory. Consultation with the other authors resolved any coding challenges.

### **Phase 6: synthesis, resynthesis, and making it all make sense.**

An iterative process of induction and deduction allowed flexibility to adjust the structure of the existing schema. This was informed by the new information found in the data set. By allocating 279 definitions of parent behaviors into categories, patterns of how these behaviors are conceptualized in the research emerged. The patterns either confirmed existing categories in the schema or prompted rearrangement of how behaviors could be categorized. For example, extracted definitions that were similar to one within the already established schema, validated the existence of that category through its presence in the literature. Concept maps were a useful method during this time of theorization.

### **Phases 7 and 8: validating and rethinking the conceptual framework.**

The framework has been presented to groups of practicing pediatric speech pathologists and nurses at conferences and meetings ( $N =$  approximately 50), with positive feedback regarding their ability to understand and make sense of the delineation and definition of categories. Validation and rethinking is also addressed via the current peer review publication process. Additional steps to validate and re-think the conceptual framework are presented in the discussion of this paper.

## **Results**

### **Conceptual Framework of Maternal Responsive and Directive Behaviors**

A hierarchical framework emerged, displayed in Figure 1, consisting of four main categories: the superordinate category, Contingent Responsiveness, and three subordinate categories, Emotional Support, Language Input Response Types, and Response to Child Foci of Attention. Each of the subordinate categories are further sub-categorized. All categories, sub-categories, labels, definitions and examples of maternal behaviors within the proposed

MR/MD framework are presented in Table 2, with reference to the aspects adopted from the two predominant original systems of coding maternal behaviors (explicit descriptions of each original system are provided in Appendices C and D). The distribution of extracted definitions and further description of the categories and sub-categories follow.

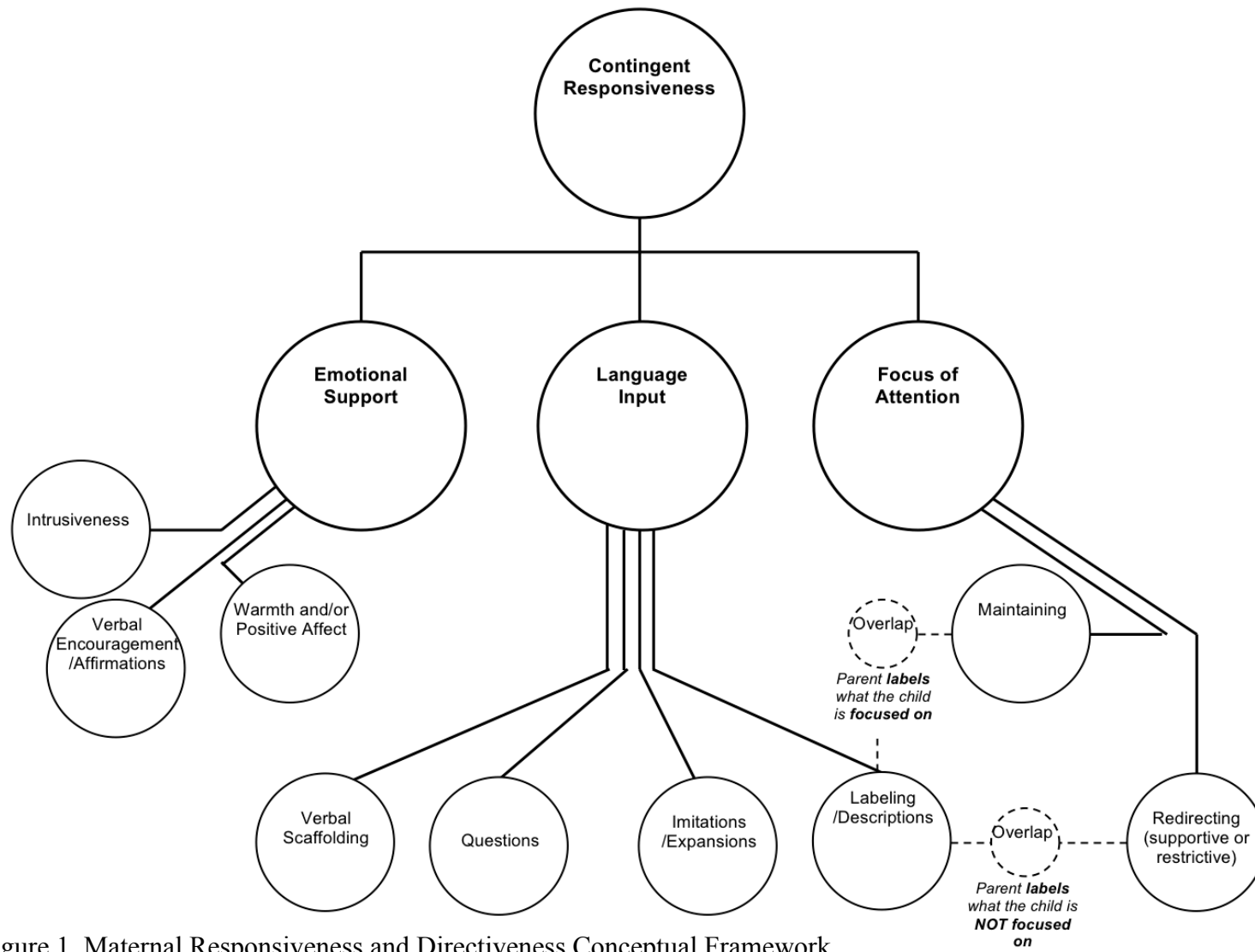


Figure 1. Maternal Responsiveness and Directiveness Conceptual Framework

Table 2

*Conceptual Framework of Maternal Responsive and Directive Behaviors*

Proposed new framework			Consists of elements from	
Category label	Behavior label	Behavior description	Original A	Original B
Contingent Responsiveness	Contingent responsiveness	An overall degree or frequency of mother's responses to child's cues or activities, such as child's vocalization; attempts to get mother's attention; and play. Includes promptness and appropriateness of mother's reactions, as well as patience and may include pace fitting with the child's abilities.	Contingent responsiveness	Frequency of maternal responses Miss <sup>a</sup>
Emotional Support	Intrusiveness	Degree of abruptness and physical expressions of impatience. May include: <ul style="list-style-type: none"> <li>taking object from infant</li> <li>repositioning that interferes with infant activity</li> <li>harsh or impatient voice and facial expressions</li> </ul>	Emotional support: Physical intrusiveness, Harsh voice tone and Restrictiveness	Prohibition/restriction a
	Verbal encouragement/affirmations	Mother's praise and encouragement of child's activity and efforts as seen through child's vocalizations and actions.	Quality of language input: Verbal encouragement	Affirmations
	Warmth and/or positive affect	Degree of sensitivity to child's cues. May include: <ul style="list-style-type: none"> <li>acceptance of interests and needs</li> <li>amount of physical affection</li> <li>enthusiasm in activities</li> <li>positive tone of voice</li> <li>avoidance of negative comments</li> <li>displays of smiling, laughing and facial animation.</li> </ul>	Emotional support: Warm sensitivity and positive affect	-
Language Input	Verbal scaffolding	Verbal hints or prompts that make logical, conceptual links between objects, persons, activities, or functions that may occur in relation to objects, activities and topics of conversation, rather than the grammatical or linguistic structure, as in expansions.	Quality of language input: Verbal scaffolding	
	Questions	Questions about an object, event, or activity.	-	Questions
	Imitations/expansions	Imitations or expansions of the child's vocalization. Saying exactly what the child says, or adding extra morphemes or words to expand upon what the child says. Provides a linguistic model, rather than offering links between concepts, as in verbal scaffolding.	-	Imitations/expansions

Proposed new framework			Consists of elements from	
Category label	Behavior label	Behavior description	Original A	Original B
	Labeling/descriptions	Specific names or descriptions of an object, action, event or activity. Studies may or may not specify whether labeling occurs within an episode of Maintaining or Redirecting the child's attention. If specification is given, the term is also coded under the corresponding element of <i>focus of attention</i> (i.e., either maintaining or redirecting).	Quality of language input: Labeling	Response type: Descriptions Joint topic focus <sup>a</sup>
Attention Focus	Maintaining	Mother follows the child's lead. Their response maintains the child's current focus of attention. May include: <ul style="list-style-type: none"> <li>• mother's request relates to activity or object the child is currently physically engaged</li> <li>• direct response to the child's attempts to attract mother's attention to an object or activity</li> <li>• a play prompt that maintains the child's focus on the current activity, but suggests a new action (e.g., "why don't you feed the doll?")</li> <li>• pointing and joint attention (e.g., mother looks at or points to what the child is looking at).</li> </ul>	Response to infant foci of attention: Maintaining	Response type: Play prompts
	Redirecting	Mother leads the interaction. Their talk/action is unrelated to the child's current focus of visual and/or physical attention. Redirecting may be supportive or restrictive in nature.  <i>Supportive intent</i> prompts the child to explore what isn't in their immediate focus of attention. The mother's response is still appropriate, contingent and prompt (e.g., redirecting for safety reasons, helping the child to focus).  <i>Restrictive intent</i> may include inappropriate physical or verbal attempts to interrupt an activity in which the child is engaged. Mother follows their own agenda, while disregarding the child's focus of attention. In this context, the mother tells the child what to do or what not to do.	Response to infant foci of attention: Redirecting  Response to infant foci of attention: Redirecting  Response to infant foci of attention: Redirecting	-  Focus <sup>a</sup> Exploratory prompt  Focus shift <sup>a</sup>

Note. Original A = works from S. Landry, et al. (2006): <http://dx.doi.org/10.1037/0012-1649.42.4.627.supp>. Original 2 = works from Baumwell, et al. (1997), Bornstein, et al. (2008), and Tamis-LeMonda, et al. (2001). See Appendices C and D for full descriptions.

<sup>a</sup> In particular this was taken from maternal behavior coding definitions from Baumwell, et al. (1997), which incorporated maternal behaviors that were directive/restrictive or were related to child's attention, unlike the other studies in 'Original B'.



## **Distribution of the qualitative data.**

The dataset of 279 definitions of responsive and directive maternal behaviors were coded into the framework categories (Table 3). Thirty-two (11.5%) definitions could not be coded into a category describing a specific type of maternal behavior because they were operationalized as a global or composite measure that combined multiple elements of MR/MD. These are a heterogeneous set of definitions and were placed in a *Global/Combined* group. Definitions were operationalized as Contingent Responsiveness - an overall frequency or scale of mothers' prompt, contingent and appropriate behaviors to children's cues or activities - 12.5% of the time. If results from the Global/Combined and Contingent Responsiveness groups were combined, it would result in 24% of 279 definitions of MR/MD being conceptualized in an 'overall' way, suggesting that the included studies mostly conceptualized and operationalized MR or MD as specific sets of behaviors rather than general measures of degree or frequency of responsiveness, or a global or composite measure.

Of the four main categories that maternal behaviors could be coded into (Contingent Responsiveness, Emotional Support, Language Input Response Types and Attention Focus), the largest number of extracted definitions was coded under Attention Focus (44.8%,  $n = 125$ ). Within this category, slightly more were in Maintaining ( $n = 66$ ; includes overlap with labeling) than Redirecting ( $n = 49$ ; includes overlap with labeling), and only 10 in General Attention. The sub-category of General Attention was required for coding definitions that were clearly about the focus of the mothers' attention, but were ambiguous or did not specify whether the mother was maintaining or redirecting. Although this category was required for coding extracted data, it is purposefully not placed in the developed conceptual framework to encourage specificity of definitions in future research. One third of the extracted definitions (33.7%;  $n = 94$ ) were coded into the Language Input Response Type category, with almost half of these into the response type of Labeling ( $n = 40$ ; includes overlap with Maintaining and Redirecting). The least coded category was Emotional Support ( $n = 25$ ).

Table 3

*Distribution of the Qualitative Data (Definitions) across Framework Categories*

Category label	Example of an extracted definition fitting this category	Proportion (%) of total extracted definitions ( $N = 279$ ) coded into category ( $n$ ) <sup>a</sup>
<b>Contingent Responsiveness (Total)</b>	A mother's utterance that was contiguous to and contingent on the child's actions or utterances (Nathanson & Rasmussen, 2011).	<b>12.5 (35)</b>
<b>Emotional Support (Total)</b>		<b>9.0 (25)</b>
Intrusiveness	Mother is over-controlling and over-involved (Tamis Le-Monda et al., 2004).	2.2 (6)
Verbal encouragement/affirmations	Utterance encouraging or approving what the child has said or done (e.g., "Wonderful, you did it right"; Lacroix et al., 2002).	2.9 (8)
Warmth and/or positive affect	Mother demonstrates love, respect and admiration for the child (Tamis Le-Monda et al., 2004).	3.9 (11)
<b>Language Input Response Type (Total)</b>		<b>33.7 (94)</b>
Verbal scaffolding	Semantically related comment on a topic established by the child such as: Child: "It's all gone", Mother: "Yes, it's all gone and now the cup is empty" (Paul & Elwood, 1991).	6.8 (19)
Questions	Requires the presences of interrogative syntax and/or intonation cues such as rising intonation (Vigil, et al., 2005).	4.3 (12)
Imitations/expansions	Direct and immediate imitation of all or part of the child's previous vocalization or a word attempt (Paavola, et al., 2005).  Grammatical rendering of the child's previous utterance, e.g., Child: "All gone", Mother: "Yes, it's all gone" (Paul & Elwood, 1991).	8.3 (23)
Labeling/descriptions <sup>a</sup>	Utterances that describe features of, or objects, individual, or events in the immediate environment, e.g., "It's raining" (Pine, 1994).	14.3 (40)
<b>Attention Focus (Total)</b>		<b>44.8 (125)</b>
Maintaining <sup>a</sup>	Mother followed or maintained infant's focus of attention by making a verbal or nonverbal remark about the infant's object of attention, e.g., infant looked at a toy, mother asked "would you like that toy over there?" (Legerstee, Markova, & Fisher, 2007).	23.7 (66)
Redirecting <sup>a</sup>	Statement that was unrelated to what the child was doing or saying (Nathanson & Rasmussen, 2011).	17.6 (49)
General or non-specified	The mother attempts to gain, maintain or direct child's interest and attention either verbally or non-verbally (Silven, Ahtola, & Niemi, 2003).	3.6 (10)
<b>Multiple categories combined into a composite or global score (Total)</b>	A composite variable computed from the means of the six dimensions of warmth, sensitivity, responsiveness, encouragement of initiative, stimulation value and elaborateness (Roberts et al., 2005).	<b>11.5 (32)</b>

<sup>a</sup> The sum of 'Total' categories is 311 because 32 definitions were coded twice, as they equally fit *Labeling/descriptions* and *Redirecting* or *Maintaining* maternal behaviors. Twenty-three of the 32 definitions explicitly referred to *Maintaining* child focus of attention through maternal *Labeling/describing* and nine of the 32 explicitly referred to *Redirecting* child focus of attention though maternal *Labeling/describing*. These are represented in Figure 1 as *Overlap*.

## **Contingent responsiveness.**

Maternal behaviors were coded directly into the category of Contingent Responsiveness if they measured an overall frequency or degree of responsive behaviors that were prompt, appropriate and contingent. Examples include the number of times a mother responds contingently to their child in 10 min; or general descriptions such as: child picks up a ball and mother refers to the ball, or the child's action. This category offers an option for researchers to operationalize MR as an overall measure of mothers' contingent responses to their children's cues or activities, as opposed to a finer level of specific detail about the characteristics of the mother's response. Contingent responsiveness is at the top of the framework because of this generality. Subsequent categories are ordered according to their increasing specificity of individual maternal behaviors.

## **Emotional support.**

Definitions of mothers' behaviors were coded as Emotional Support when they related to the emotional component of the interaction rather than the language-learning component (e.g., the mother's emotional availability as seen through encouragement, impatience, sensitivity, versus labeling objects, expanding child's utterances etc). Emotional Support consists of three sub-categories: (1) Intrusiveness – the degree of mothers' abruptness and physical expressions of impatience, e.g., mother says, "No. Not like that!" and takes toy away from the child; (2) Warmth and/or Positive Affect – the degree of sensitivity and acceptance to the child's cues, interests and needs, e.g., positive interaction; and (3) Verbal Encouragement/Affirmation – mothers' emotionally supportive responses in the form of praise and encouragement of children's activities and efforts, e.g., child vocalizes or performs an action and mother says, "That's right, you did it!".

The Emotional Support category of the framework was derived by making several adjustments to the original schemas. Landry and colleagues' (2006) original categories of Positive Affect and Warm Sensitivity were combined to make the current, Warmth and/or Positive Affect, and their categories of Restrictiveness, Physical Intrusiveness and Harsh Voice Tone were combined with Baumwell and colleagues' (1997) Prohibition/Restriction to form the new category, Intrusiveness. These changes were guided by patterns that emerged in the dataset about how restrictive/intrusive behaviors were defined similarly, and were present in each of the chosen elements from the original systems. Notably in the presenting framework, Intrusiveness is considered to reflect 'emotional' aspects of (non) responsiveness, which is why it is placed within Emotional Support, and it is also viewed to be independent of 'Directiveness', which is placed as a subcategory Attention Focus. The final Emotional Support sub-category combines Verbal Encouragement (from Original A, Table 2) and Affirmations (from Original B, Table 2) into Verbal Encouragement/Affirmations. Although Verbal Encouragement was originally located under mother's language quality (Appendix C) its current placement in the new framework reflects the intent of the mother's utterance as being emotionally supportive and encouraging (e.g., "Well done!"), rather than being a language model (e.g., "The red car").

### **Language input response types.**

Language Input Response Types incorporates maternal responses that provide models of the content, structure, and/or meaning of language. Maternal behaviors can be categorized into one of four sub-areas, which are: (1) Verbal Scaffolding (from Original A) – verbal hints to give logical, meaning-based links between objects, persons, activities or functions, e.g., child says, "All gone", and mother says, "Yes. Now it is empty"; (2) Questions (from Original B) – mother asks a question about an object, event or activity, e.g., "What is this?", "Where is the ball?", "What are you doing?"; (3) Imitations/Expansions (from Original B) – mother imitates or expands on a child's prior

vocalization, e.g., child says, /bo/ and mother responds with, “Ball” (imitation) or “Big ball” (expansion); and (4) Labeling/Descriptions (from Original A and B) – mother provides specific names or descriptions of an object, action, event, or activity, e.g., child is playing with a red ball and mother says, “That’s a big ball”. Note that it is different to Imitations/Expansions because it is not an expansion of the child’s previous vocalization, rather it is a description or label of the situation. It also differs from Verbal Scaffolding because it does not build upon the meaning of the object, such as saying “balls are for bouncing”.

### **Responses to child foci of attention.**

Responses to Child Foci of Attention, refers to maternal behaviors that either maintain or redirect the child’s current focus of attention. This category consists of two sub-categories: (1) Maintaining (from Original A and B) – mother’s responses that follow the child’s lead and maintain the child’s current focus of attention, e.g., while an infant is holding a block out to the mother, mother says, “Do you want me to take that block?” and (2) Redirecting – mother’s responses that do not follow the child’s lead, but instead, redirect the child’s current focus of attention to something unrelated, e.g., while the child is playing with a toy truck, the mother says, “Come and play with these bubbles!”.

The labels and definitions for Maintaining and Redirecting incorporate elements from both original theories A and B (Table 2 and Appendix C). Maintaining combines definitions from Maintaining in Original A and Play Prompts from Original B, and Redirecting combines definitions from Redirecting in Original A and Focus, Focus Shift and Exploratory Prompt from Original B. The Focus and Focus Shift definitions in Original B differentiate between the intent of a mother’s redirective behavior, that is, whether behaviors attempt to focus an unfocused child versus shift the child’s focus to follow the mother’s agenda (Appendix C). A number of Redirecting definitions across the extracted definitions in the dataset supported the conceptualization of mothers’ redirecting

behaviors based on intent. That is, those which are supportive (e.g., redirecting for appropriate safety reasons or to help a child focus) or intrusive (e.g., redirecting because mother is disregarding child's interests) in nature.

Some studies described mother's 'redirecting' or 'following' behaviors in specific reference to *labeling* or *describing* an object or action that the child is or is not focused on. This type of description of maternal behavior, which includes *both* aspects of attention focus *and* labeling, is coded into the category, 'Overlap', which was added to the framework in order to accommodate for this type of definition (Figure 1). Theoretically, Overlap-type categories, as with redirecting and maintaining, could also exist in other areas, for example a 'redirecting question', or a 'maintaining expansion', however these potential ways of referring to mothers' behaviors in combination with maintaining or redirecting were not reflected in the extracted definitions, and thus, were not added to the framework.

## **Discussion**

### **Offering a New Perspective**

This research proposes a conceptual framework for the constructs of MR/MD developed using Conceptual framework analysis (Jabareen, 2009). Currently, when MR or MD is investigated in the literature in relation to child development outcomes, the labels and definitions used by independent researchers vary considerably. Consequently, interpretation and comparison of research findings across studies can be complicated and confusing for a number of reasons – terms can be misleading because they may refer to similar or different concepts across studies, dependent on their definition; definitions may not always be comprehensive and clear; and different types of maternal behaviors can be combined into global or composite measures. The onus is on readers to discern whether studies are referring to the same or different types of maternal behaviors based on the

terms and definitions they use, when they are interpreting the research for application in practice or policy.

A conceptual framework for this construct offers researchers a unified way to conceptualize and operationalize the responsive and directive maternal behaviors they are examining. Up until now, a formal method of developing a MR/MD conceptual framework, specifically informed by the literature that uses it, has not occurred. Through the Conceptual framework analysis process (Jabareen, 2009), this research has aggregated and synthesized the ways that 82 quality research papers define mothers' responsive and directive behaviors, by coding researchers' definitions ( $N = 279$ ) into similar categories. The categories were informed by credible existing systems and theory, which are referred to in this paper as Original A (Landry, et al., 2006; Landry, et al., 2000; Smith, et al., 2005; Smith, et al., 1996) and Original B (Baumwell, et al., 1997; Bornstein & Tamis-LeMonda, 1989; Bornstein, et al., 2008; Bornstein, et al., 1992; Tamis-LeMonda, et al., 2001). Through an iterative process, these systems informed the organization of behavior categories, in conjunction with the emerging themes from 279 extracted definitions that informed changes to the original systems.

As a result, the presenting MR/MD framework consists of four main categories (Contingent Responsiveness, Emotional Support, Language Input Response Type, and Attention Focus), of which, the latter three are further split into specific types of maternal behaviors. The subcategories of Emotional Support are: Intrusiveness, Verbal Encouragement/Affirmation, and Warmth and/or Positive Affect; Language Input Response Types are Verbal Scaffolding, Questions, Imitation/Expansion, and Labeling/Descriptions; and Attention Focus are Maintaining and Redirecting. Some extracted definitions within the category of Attention Focus either, did not specify maintaining or redirecting, or, incorporated *both* aspects of maintaining *and* redirecting. A sub-category, 'General Attention' (Table 3) was catered for this coding nuance, however, this was purposefully not included in the final framework, in order to encourage future

researchers to be specific in their definitions. Theoretically, redirecting could also be further split into behaviors that are supportive or intrusive in nature – for example, redirecting for appropriate safety reasons, or developing appropriate attention skills such as reading a book, vs. simply redirecting because mother is disregarding child's interests. There was insufficient clarity around this notion to be included into the framework; however, researchers exploring redirective behaviors are encouraged to specify the difference.

Finally, the conceptual framework does not accommodate global or composite measures of MR/MD that encompass more than one aspect of the framework. For example, a composite score that combines rating scales for the aspects of Labeling/descriptions and Warmth and/or positive affect (e.g., Emotional Responsivity in Rafferty, et al., 2011). This is not to say that there is no place in the research for conceptualizing or operationalizing the MR/MD construct in this global kind of way – it just does not lend itself to being a part of a conceptual framework that proposes an internal structure.

## **Strengths, Considerations and Future Directions**

Several strengths of this research come from the methodology used. First, by adopting the Conceptual framework analysis technique (Jabareen, 2009), which is specifically designed to “build conceptual frameworks for multidisciplinary phenomena linked to different bodies of knowledge” (p. 50), this research is systematic in its approach to gathering, synthesizing and applying qualitative information gathered from existing text. The technique highlights the importance of examining and integrating existing theory (in the form of already existing systems) and text (in the form of the different terms and definitions of a concept). The present research illustrates the successful application of this relatively new technique to a real example of a complex phenomenon that is MR/MD. Additional methodological strengths of the present research include the utilization of a comprehensive and systematic search strategy, which reasonably ensures capturing the



existent qualitative information on the topic; and the critical appraisal of studies prior to being included, in order to capture quality data.

Another strength of this MR/MD conceptual framework is that it is entirely founded in, and informed by the literature. Consequently, the resulting conceptual framework is a reflection of the terms and definitions of maternal behaviors already in use in over 80 studies. However, an important consideration arising from this fact is that the 279 definitions of MR and MD came from research studies that met certain eligibility criteria, which were essentially, that they examined responsiveness prior to the children's age of three years old in typically-developing or language-delayed population, and that the studies investigated MR/MD in relation to children's language outcomes. Consequently, it is possible that other bodies of research examining the MR/MD construct in relation to other aspects of child development could have informed the framework differently, such as by identifying additional categories of maternal behavior, or placing less emphasis on existing categories. Also, the literature informing the MR/MD framework is predominantly from the Organization for Economic Co-operation and Development (OECD) western countries and in the English language. Further research would be required to extend the framework across culture and language.

Another consideration is that the framework is labeled as 'maternal', as opposed to a term inclusive of fathers (e.g., 'parental'). This is because the definitions from the research that informed the framework are predominantly in relation to maternal behaviors. That is, the framework reflects mainly the research about mothers. Therefore the framework may not accurately reflect fathers' responsive and directive behaviors. It is possible that further empirical studies about fathers' responsive and directive behaviors could inform the framework differently, by revealing other categories of behaviors. It is also possible that it could confirm the current categories of behaviors in the framework are applicable to both mothers and fathers equally. In any case, while a small number of studies have included fathers' behaviors in relation to children's language development

(Girolametto & Tannock, 1994; Tamis-LeMonda, et al., 2004), the present research identifies a potential gap in the literature regarding descriptions of the responsive and directive behaviors of fathers.

The conceptual framework is based on qualitative data, and not on statistical associations shown to occur, or not occur between categories. This highlights a possible area of future research. On reviewing over 300 studies, it was apparent that investigating associations between types of maternal responses is not commonly a primary research goal. However, some studies have explicitly sought to answer that question and support the notion of conceptually different or similar types of maternal behaviors (Bornstein, et al., 2008; Marfo, 1992; Pine, 1992). A systematic synthesis (with or without meta-analysis) of such quantitative information would be useful in statistically confirming the relations between elements of the framework, and to help identify what level of detail for categorizing behaviors one needs to go to. For example, how important is it to differentiate between supportive or intrusive redirecting? And is the response type of Labeling/descriptions statistically associated closely enough to Imitations/expansions, that they could potentially be combined as one response type, rather than separated into two subgroups under the Framework's category of Language Input?

A final consideration for future advances with the presenting framework, is to formally validate it through an extension of Phases 7 (validating) and 8 (rethinking) of Jabareen's (2009) Conceptual framework analysis. That is, to explore whether the framework makes sense to other scholars or clinicians, and to consider the framework as a dynamic process, which is open to revision based on multidisciplinary feedback, insights and new literature in the field. Validity seeks to ensure that the conceptual framework truly represents what it purports to represent, in this case, the construct of MR/MD. So while the framework was derived from analysis of a vast literature base it could be validated with formalized qualitative approaches such as questionnaires or focus groups to obtain feedback from experts or users in the field.

In summary, by proposing a MR/MD conceptual framework grounded in credible methodology, this research may provide a valuable starting point to unify the conceptualization and operationalization MR and MD. An increased consistency of how maternal responsive and directive behaviors are labeled and defined in the literature will enable an easier route to synthesize and translate their important research evidence into action and policy.

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## Appendix A

### Search Eligibility Criteria (PICO)

Area	Inclusion/Exclusion Criteria
Participants	Parents who do not present with clinically significant risk factors (e.g., mental illness, hearing impairment) and children born full term, who are typically developing or language delayed (in the absence of co-morbidities) aged 0 – 36 months or average utterance length below 2.5 morphemes (e.g., ‘On box’, ‘My toy’).
Phenomena of Interest	Parents’ responsive behaviors, which are contingent on children’s behaviors.
Studies	Randomized control studies, quasi-randomized trials and quasi-experimental prospective and analytical observational studies including retrospective cohort studies, case control studies and analytical cross sectional studies.
Outcomes	Outcomes relating to children’s prelinguistic development (e.g., early vocalizations, attention, pointing), sound awareness (i.e., phonology), receptive and expressive vocabulary, or receptive and expressive syntax.

## Appendix B

### Search Logic Grid (Psycinfo database)

Language Development	Parents	Infant	Responsiveness
SU vocabulary OR SU Word recognition OR SU facial expressions OR SU Speech disorders OR SU speech characteristics OR SU infant development OR SU infant vocalization OR SU Oral communication OR SU verbal communication OR SU Communication skills OR SU Communicative disorders OR SU Speech OR SU speech development OR SU Speech perception OR SU Grammar OR SU gestures OR SU linguistics OR SU pragmatics OR SU metalinguistics OR SU Morphemes OR SU Morphology (language) OR SU Phonological awareness OR SU Nouns OR SU childhood play behavior OR SU Psycholinguistics OR SU Phonology OR SU Rhyme OR SU attention OR SU comprehension OR SU verbal ability OR SU language development OR SU Delayed development OR SU Language delay OR SU Language disorders OR SU Language OR SU language proficiency OR SU Specific Language Impairment OR TI "language proficiency" OR AB "language proficiency" OR TI "language perception" OR AB "language perception" OR TI "language development" OR AB "language development" OR TI "language delay*" OR AB "language delay*" OR TI "language disorder*" OR AB "language disorder*" OR TI "language acquisition" OR TI "delayed language" OR AB "delayed language" OR TI "Specific language impairment" OR AB "Specific language impairment" OR TI SLI OR AB SLI OR TI "Language proficiency" OR AB "Language proficiency" OR AB "language acquisition" OR TI "Speech perception" OR AB "Speech perception" OR TI "Speech development" OR AB "Speech development" OR TI "Speech delay*" OR AB "Speech delay*" OR TI "Speech disorder*" OR AB "Speech disorder*" OR TI "Speech acquisition" OR AB "Speech acquisition" OR TI "Delayed speech" OR AB "Delayed speech" OR TI "Speech characteristics" OR AB "Speech characteristics" OR TI "Mean length of utterance" OR AB "mean length of utterance" OR TI MLU* OR AB MLU* OR TI morpheme* OR AB morpheme* OR TI morpholog* OR AB morpholog* OR TI Phonolog* OR AB Phonolog* OR TI noun* OR AB noun* OR TI phonetic* OR AB phonetic* OR TI semantic* OR AB semantic* OR TI linguist* OR AB linguist* OR TI "communicative disorders" OR AB "communicative disorders" OR TI comprehension OR AB comprehension OR TI "facial expression*" OR AB "facial expression*" OR TI talk* OR AB talk* OR TI Nonverbal OR AB Nonverbal OR AB non-verbal OR TI non-verbal OR TI smil* OR AB smil* OR TI vowel* OR AB vowel* OR TI gesture* OR AB gesture* OR AB Preverbal OR TI preverbal OR TI prelinguistic OR AB prelinguistic OR AB Preverbal OR TI pre-verbal OR TI pre-linguistic OR AB pre-linguistic OR TI Articulation OR AB Articulation OR TI vocubular* OR AB vocubular* OR TI gaz* OR AB gaz* OR TI vocaliz* OR AB vocaliz* OR TI vocalis* OR AB vocalis* OR TI Babbl* OR AB Babbl* OR TI cooing OR AB cooing OR TI attention OR AB attention OR TI "word production" OR AB "word production" OR TI "first word*" OR AB "first word*" OR TI "verbal behaviour" OR AB "verbal behaviour" OR TI "verbal behavior" OR AB "verbal behavior" OR TI "verbal ability" OR AB "verbal ability"	SU Parents OR SU parental role OR SU parent child relations OR SU mother child relations OR SU father child relations OR SU caregivers OR SU At risk populations OR SU Mothers OR SU adolescent mothers OR SU Fathers OR SU adolescent fathers OR SU parental involvement OR SU mother child communication OR SU mother child communication OR SU father child communication OR TI Mother* OR AB Mother* OR TI Parent* OR AB Parent* OR TI Father* OR AB Father* OR TI maternal OR AB maternal OR TI paternal OR AB paternal OR AB caregiver* OR TI caregiver* OR AB caretaker* OR TI caretaker* OR TI "at risk populations" OR AB "at risk populations"	SU childhood (birth-12 yrs) OR SU infancy (2-23 mo) OR SU Preschool Age (2-5 yrs) OR SU Neonatal (birth-1 mo) OR SU preschool students OR TI neonatal OR AB neonatal OR TI toddler OR AB toddler OR TI preschool* OR AB preschool* OR TI Child* OR AB child* OR TI infan* OR AB infan* OR TI baby OR AB baby OR TI babies OR AB babies	TI Directiveness OR AB Directiveness TI responsiveness OR AB responsiveness OR TI sensitive OR AB sensitive OR TI engagement OR AB engagement OR TI 'child-directed speech' OR AB 'child-directed speech' OR TI 'infant-directed speech' OR AB 'infant-directed speech' OR TI "maternal control" OR AB "maternal control" OR TI dyads OR AB dyads OR TI "joint attention" OR AB "Joint attention"

## Appendix C

### Definitions of Maternal Behaviors

#### Original A

Maternal Interactive Behavior	Definition
<i>Contingent Responsiveness</i>	Degree of responsiveness to infant cues including promptness and appropriateness of maternal reactions, appropriate pace that fits infant's abilities and patience.
<i>Emotional Support</i>	
Positive Affect	Degree to which mother displays smiling, laughing, and facial animation.
Warm Sensitivity	Degree of sensitivity to infant cues including acceptance of interests and needs, amount of physical affection, enthusiasm in activities, positive tone of voice, and avoidance of negative comments.
Restrictiveness	Maternal physical or verbal attempts to interrupt an activity in which the infant is engaged, often involving statements such as, "get that toy out of your mouth", or taking an object from the infant.
Physical Intrusiveness	Degree of abruptness when moving infant or taking objects away, physical expressions of impatience, and repositioning that interferes with infant activity.
Harsh Voice Tone	Impatient, and/or harsh verbal intonation directed to infant.
<i>Responses to Infant Foci of Attention</i>	
Maintaining	Maternal request that relates to the activity or object in which the infant is currently visually and physically engaged (e.g., while infant holding rattle, mother says, "yeah, that's a rattle"), or is in direct response to the infant's attempts to attract mother's attention to an object activity (e.g., "Do you want me to take that block?", while infant is holding a block out to mother).
Redirecting	Maternal request that is unrelated to the infant focus of visual and/or physical attention.
<i>Quality of language input</i>	
Verbal Scaffolding	Verbal hints/prompts offered that provide conceptual links between objects, persons, activities, or functions that may occur in relation to objects, activities, and topics of conversation
Labeling	Specific names of objects (e.g., "ball") and actions (e.g., "Can you roll it?") provided during the interaction with infant.
Verbal Encouragement	Statements that involve praising infants' efforts (e.g., "way to go") or serve to encourage their activity involving objects or toys or infant's vocalizations ("yeah", "that's it").

*Note.* This table replicates what is found in [http://dx.doi.org/10.1037/0012-](http://dx.doi.org/10.1037/0012-1649.42.4.627.suppl)

[1649.42.4.627.suppl](http://dx.doi.org/10.1037/0012-1649.42.4.627.suppl) in Landry et al., 2006.

## Appendix D

### Definitions of Maternal Behaviors

#### Original B

Response Type	Definition
Bornstein, et al. (2008, p. 869); Tamis-LeMonda, et al. (2001, p. 752)	
Frequency of Maternal Responses	Frequency of which mothers responded to each of the child target activities. E.g., frequency of responses to child vocalizations, frequency of responses to child bids to mother etc.
Affirmations of Child Action	“Yes,” “That’s right”, “Good job”.
Imitations/ Expansions	Imitations/expansions of child vocalization (“ball” after child uttered “ba”).
Descriptions	Descriptions of an object, event, or activity (“That’s a blue spoon”, “That’s the spoon you’re holding”).
Questions	Questions about an object, event, or activity (“What is that?”).
Baumwell, et al. (1997, p. 250)	
Play Prompts	Play prompts or demonstrations (“Feed the doll”, “Why don’t you feed the doll?”).
Exploratory Prompts	“Look here”, “What else can we do?”.
Responsiveness	A positive and meaningful change in mother’s verbal behavior subsequent to and dependent on a child exhibiting a vocal or exploratory act
Joint Topic Focus	Child maintained attention to the same toy (did not change activity), and mother continued to elaborate verbally on the toy or the child’s activity with the toy. E.g., child looked at the brush and mother said “Brush. It is green”.
Focus	Mother attempted to verbally focus an unfocused child on the toys (e.g., orienting her child with “Look at the brush”).
Prohibition/ Restriction	Mother negated or discouraged her child’s behavior (e.g., saying “no” or “not like that”).
Focus Shift	Child was focused on a toy for at least 2 s, and mother attempted verbally to direct her child’s attention toward a different toy. E.g., if a child looked at a brush and mother said, “look at the cup”.
Miss	Mother failed to respond verbally to a new child activity within a 5-s period or before her child shifted focus (e.g., a child looked at the brush and mother didn’t respond within a 5-s period).

*Note.* Each term and definition (with examples) is presented as direct quotes from citations.

## Section Two

### **Chapter 4: Associations Between Children’s Language Outcomes and Contingent Responsiveness: A Systematic Review**

The following chapter contains the content of the original article:

Saliba Luppino, M., Tivey, D. R., James, D. H., & Attard, M. (text in manuscript). The association between children’s language development and early parental contingent responsiveness: A systematic review.

The systematic review assesses the association of one aspect of PRD that was informed by the conceptual framework, *contingent responsiveness* (Chapter Three), with a variety of child language outcomes. Footnotes are identified by superscript numbers and are presented at the end of the document. Appendices referred to within this chapter are located at the end of the chapter.

See Thesis appendices for additional information relating to the systematic review critical appraisal instruments (Appendix D), data extraction instrument (Appendix E), exclusions following full text review (Appendix F), and exclusions following critical appraisal (Appendix B).

# Statement of Authorship

Title of Paper	The Association between Children's Language Development and Early Parental Contingent Responsiveness: A Systematic Review
Publication Status	<input checked="" type="checkbox"/> Submitted for Publication
Publication Details	Saliba Luppino, M., Tivey, D. R., James, D. H., & Attard, M. (submitted Jan 2016). The association between children's language development and early parental contingent responsiveness: A systematic review. <i>Journal of Child Language</i> .

## Principal Author

Name of Principal Author (Candidate)	Melissa Saliba Luppino
Contribution to the Paper	Conception and design/analysis and interpretation of data (developed and performed comprehensive systematic review search and eligibility screening; critical appraisal of included studies; data extraction; metaanalysis and data synthesis; writing and critically reviewing the manuscript; gave final approval of the version to be published; acted as corresponding author.
Overall percentage (%)	90%
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	Date 23/3/16

## Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:  
 the candidate's stated contribution to the publication is accurate (as detailed above);  
 permission is granted for the candidate to include the publication in the thesis; and  
 the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr David Tivey
Contribution to the Paper	Conception and design/analysis and interpretation of data (supervised development of work; assisted in choice of meta-analytical approach and software, and data entry for meta-analysis; assisted in data interpretation); helped to critically review, evaluate and edit the manuscript; gave final approval of the version to be published.
Signature	Date 23/5/16.

Name of Co-Author	Dr Deborah James
Contribution to the Paper	Conception and design (involved in protocol peer-review process); interpretation of data; helped to critically review, evaluate and edit the manuscript; contributed conceptual knowledge about child language development; gave final approval of the version to be published.
Signature	Date 21/4/16

Name of Co-Author	Dr Melanie Attard
Contribution to the Paper	Conception and design; Helped to critically review, evaluate and edit the manuscript; gave final approval of the version to be published.
Signature	Date 28/3/16.



## ORIGINAL ARTICLE

# **The association between children's language development and early parental contingent responsiveness: A systematic review**

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**January 2016**

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## **Abstract**

This systematic review examines the association between parents' contingent responses to young children and subsequent language development, to provide evidence synthesis relating to parent-orientated clinical practices. Twelve studies are reviewed through meta-analyses and narrative syntheses. Meta-analyses indicated: (1) a positive association between contingent responsiveness and receptive vocabulary (pooled effect size, correlation coefficient:  $r = .22$ ,  $p < .01$ ); and (2) that children with typically developing language experienced statistically significantly larger levels of parental contingent responsiveness compared to those with language delay (pooled effect size, standard mean difference:  $SMD = .81$ ,  $p = .001$ ). Results from narrative syntheses support associations between contingent responsiveness and early vocalizations, attention, expressive and receptive vocabulary and syntax. Overall, results suggest a moderate to strong, positive and statistically significant association between contingent responsiveness and child language. A number of challenges to synthesizing data on this topic are discussed.

Keywords: parent, contingent responsiveness, language development, systematic review.

## **Introduction**

### **Child Language Development and Parental Responsiveness**

Robust childhood language skills seem to act as a protective factor across many areas of life (Gross, 2008), of which they have been associated with – later literacy, social, emotional and vocational outcomes (Catts, 1993; Durand, Loe, Yeatman, & Feldman, 2013; Gross, 2008; Hurtado, Marchman, & Fernald, 2008; Sheridan, Knoche, Kupzyk, Edwards, & Marvin, 2011; Song et al., 2014; Walker, Greenwood, Hart, & Carta, 1994). If so, this means that the estimated 5-20% of young children with language problems (Nelson, Nygren, Walker, & Panoscha, 2006; Reilly et al., 2010; Tomblin et al., 1997; Wake et al., 2011) may not have this protection, placing them at increased risk for poorer outcomes. This then raises the question of whether the risk factor can be converted into a protective factor, and by what means. Current modelling accounts for approximately 30% of the variance of outcomes in child language (Reilly et al., 2010), leaving further room for explanation (Reilly, McKean, Morgan, & Wake, 2015).

One of the many variables associated with child language status is parental responsiveness (PR), that is, how parents respond to their children's communicative and exploratory behaviors. A positive association seems to exist, that is, as PR increases so to do children's communication and language skills (Landry, Smith, Swank, & Guttentag, 2008; Nicely, Tamis-LeMonda, & Bornstein, 1999; Tamis LeMonda, Bornstein, & Baumwell, 2001). As such, many interventions to ameliorate childhood language difficulties focus on parents as the agents of change (Girolametto, 1988; Landry et al., 2008; Tannock, Girolametto, & Siegel, 1992) because responsive parenting interactions during infancy and early childhood are seen as important in shaping child language development. For example, responsive parenting was shown to be an effective intervention

for improving child language outcomes in a randomized controlled trial (Landry et al., 2008). This indicates that parents can be taught to improve the quality of their interactions for subsequent improvement in children's language development. Observational studies also support associations between responsive parent interactions with zero- to three-year-olds and preverbal and language outcomes such as infant vocalizations, vocabulary acquisition, measures on various standardized language tests and the attainment of early language milestones (Dunst, Gorman, & Hamby, 2010; Landry et al., 2008; Nicely et al., 1999; Tamis-LeMonda et al., 2001; Tamis-LeMonda, Bornstein, Baumwell, & Damast, 1996). In some cases, the associations were maintained even after controlling for child-related factors such as language ability (Baumwell, Tamis-LeMonda, & Bornstein, 1997; Tamis-LeMonda et al., 2001), indicating directionality of the association.

However, for clinical decision making, it can be challenging to navigate and interpret the existing literature on the association between children's language and PR because of variation in the literature relating to (a) the type of responsive parent behavior being investigated, and the ways they are labeled, described, and measured, (b) the ways in which language outcomes are measured, (c) the ages at which parent and child measures are taken, and (d) statistical methods. For example, what aspect of PR is best to target for a particular client age, level of ability, or cultural background? Is it more clinically effective in terms of childhood language outcomes, to target a specific PR skill, such as language modelling (i.e., labeling, describing), or emotional responsiveness (i.e., warmth and encouragement), or to focus more broadly on a parent's general capacity to provide more frequent, prompt, appropriate and contingent interactions?

Furthermore, a clearer understanding of the associations between different aspects of PR and child language outcomes could help identify whether specific or general aspects of PR are useful clinical indicators for predicting or explaining persistent language delay. For example, it is reported that the accuracy of early identification of children at risk of

persistent language delay could be improved with the identification of strong predictive risk factors to supplement early language screening (Down, Levickis, Hudson, Nicholls, & Wake, 2014; Levickis, Reilly, Girolametto, Ukuomunne, & Wake, 2014), and could be assisted by a predictive tool to identify and prioritize children at risk of lasting language delay (Reilly et al., 2014). Parental responsiveness could be explored as one of the predictive risk factors, however, the research information is obfuscated because it is so complex.

Greater clarity about the nature of the association between specific characteristics, or types, of PR and child language outcomes will strengthen confidence in the research base, particularly for translation into policy and clinical practice. There have been reports in the literature of these associations for at least 30 years (Bornstein, Miyake, Azuma, & Tamis-LeMonda, 1990; Coates & Lewis, 1984; Down et al., 2014; Levickis et al., 2014; Tamis-LeMonda et al., 1996), highlighting the value of a systematic review to synthesize the best available evidence on the topic to date. An aim of this systematic review is to explore whether a drilling right down to a specific aspect of PR – *contingent responsiveness (CR)* – might help to uncover a further area for variance of outcomes in child language. This systematic review intends to provide an overall finding about the association between child language outcomes and *CR*. By synthesizing empirical data about this clearly defined aspect of PR, it is hoped that this research contributes to a clearer understanding of the topic.

## **Contingent Responsiveness**

Contingent responsiveness occurs when parents respond to their children's communicative and exploratory behavior promptly, contingently and appropriately (Baumwell et al., 1997; Bornstien & Tamis-LeMonda, 1989; Bornstein, Tamis-LeMonda, Hahn, & Haynes, 2008; Nathanson & Rasmussen, 2011; Paavola, 2006; Tamis-LeMonda

et al., 2001; Tamis-LeMonda et al., 1996). Contingent and appropriate responses are those that are conceptually dependent upon and connected to the child's preceding behavior, and relevant to the context of the interaction. For example, a parent saying 'shake' in response to a child shaking a rattle is contingent because it relates to the child's actions with the rattle, and appropriate to the context of the child exploring what they can do with the rattle. A response is prompt if it occurs within 2-30 s of the child's preceding behavior (Bornstein & Tamis-LeMonda, 1997; Bornstein et al., 2008).

In aiming to narrow the definition of PR – which in this paper, is considered a broader 'umbrella' term that may encompass many types of parent behaviors (e.g., 'labelling' an object or action; 'asking questions'; providing 'affirmations') – the term, *CR* is used. Contingent responsiveness is defined as the degree or frequency of responsiveness to a child's target activities, including promptness and appropriateness of parental reactions, as well as appropriate pace that fits the child's abilities. Both the term and definition are closely based on the works of Bornstein et al. (2008) and Landry, Smith, and Swank (2006, online supplement). Although this way of defining PR (*CR*) remains general, in that it does not explicate specific parent behaviors, it is acceptable because it incorporates the characteristics of promptness, contingency and appropriateness, which are considered "minimally necessary and sufficient" (Bornstein et al., 2008, p. 867). Also, the frequent use of this kind of definition in peer-reviewed papers suggests its acceptance in the field. Studies that define PR in this way tend to operationalize it as an overall frequency count or scale, measuring parents' overall (prompt, contingent and appropriate) verbal responses to children's target activities, rather than a more fine-grained account of specific types of responses (Tamis-LeMonda et al., 1996a, 1996b; Tamis-LeMonda, Bornstein, Kahana-Kalman, Baumwell, & Cyphers, 1998; Wasserman, Allen, & Linares, 1988). For example, rather than looking only for a specific type of behavior like parents' imitation of children's words or parents' question-asking, studies measure the number of

times or time intervals (e.g., 10 s intervals) in which a parent verbally responds to their child in a prompt, contingent and appropriate way.

## **Theoretical Background**

The mechanism by which PR facilitates language development has been described in terms of its connection to communicative intentionality (pragmatics) and word mapping (semantics; see Tamis-LeMonda, Kuchirko, and Song, 2014, for a recent detailed account). Through episodes of joint attention, by which an infant and parent are both focused on the same object or event, infants come to understand that language is a tool for sharing intentions and meaning, and that words are the symbols of that meaning. During joint attention the infant is primed to learn because they are “attentive, motivated, and best able to determine the meaning of [their] mother’s language” (Tomasello & Farrar, 1986, p. 1462). Under these circumstances, parent responses that are contingent upon and appropriate to the infant’s attentional focus or prior communicative act presumably help the infant connect the parent’s words with the object or event of their attention, thus facilitating semantic mapping. Parents’ contingent responses also promote conversational participation, which provides opportunities to practice social and linguistic aspects of language (Girolametto et al., 2002). Contingent parent responses are also thought to support children’s learning by “allowing children to feel safe in exploring their environment and in signalling their interests and needs” (Landry et al., 2003, p. 561), thus reinforcing and supporting their natural curiosity and attempts at learning.

These notions are consistent with a social interactionist perspective, in which infants’ language abilities are thought to develop through the interplay of innate capacities and social interactions with their caregivers and others (Weiten, 1998). Two main considerations for this perspective are: (1) that the infant presents with a current level of ability and has potential to increase that level of ability when assisted by parental

scaffolding (explained by Vygotsky's zone of proximal development [1930-1934/1978]), and (2) that parents influence infant development through their didactic interactions.

Contingent responsiveness is fundamental to the social interactionist perspective (Girolametto et al., 2002), perhaps because the infant's present communication capacity is scaffolded to the next level via contingent, developmentally and contextually appropriate parent responses. For example, an infant at the level of showing communicative intent by pointing to a ball can be supported to reach the next level of ability (e.g., production of single words) through the parent pointing to, and saying the word *ball* within seconds of the infant's pointing gesture. The parent continues to support the infant in this way until the infant has shifted into that next level or 'zone' of development (i.e., single word production) and can function at that level independently. In this example, the parent helps the infant move from one level of development (non-verbal intent) to the next (production of single words) by providing responsive verbal and gestural cues, which are linguistically simplified (Girolametto et al., 2002), connected to the infant's prior behavior, and are at a level and pace that is congruent with their developmental level (Landry, Smith, & Swank, 2003).

## **Review Question**

This research investigates the association between parental CR and children's language development via systematic review, by analyzing the quantitative data from included studies, using meta-analysis or narrative synthesis, in order to answer the following question: To what extent is parental CR towards children aged birth to three years associated with their language development?



## **Methods**

### **The Systematic Review**

A systematic review examining association between parental CR and a variety of child language outcomes has not been conducted previously; based on a literature search in June 2011 (repeated in October 2013 and January 2015) on PubMed, the Joanna Briggs Database of Systematic Reviews and Implementation Reports, and the Cochrane Library of Systematic Reviews. A systematic review specifically examining the influence of parents' CR in the first three years of life on a range of child language outcomes will provide insight into parents' early role in shaping children's emergent language. This evidence can be used to support the case for clinical applications such as responsive parenting approaches for improved child language outcomes, and the process of early identification of language delay. Findings from the systematic review can also be used to inform policies, practices and promotion of responsive parenting in early childhood for improved child language outcomes. Finally, the review will help identify areas of research gaps or excess in the context of a growing empirical research base, providing an informed direction for future research and allocation of resources.

### **Inclusion and Exclusion Criteria**

#### **Types of participants: parents and children.**

Parents who were identified in either the well or at risk populations were included. 'Well parents' refers to the general public who are not affected by current suffering (Gordon, 1983). 'At-risk parents' are those whose social circumstances place them at risk of being less responsive to their children. For example, parents of low education or intellectual capacity, of certain age (e.g., teenage parents) and parents reported to be

experiencing depressive symptoms from subjective reports or assessments.<sup>1</sup> Parents were not included if they were reported to have clinically diagnosed mental illness or hearing impairment. Primary carers other than parents (e.g., grandparents, child care staff) were not included.

Children from birth (preverbal) up to an approximate age of three years were included. Studies with older samples were included only when their earlier years were also reported. The upper age limit was clearly defined by expressive language level according to Brown's stages, which provides a framework of expressive language development based on the presence of grammatical markers in spoken language (Brown, 1973).<sup>2</sup> Brown's stages are commonly used as a way of defining children's language age in research and clinical practice (Blackwell, 2005; Paul & Alforde, 1993; Rescorla & Robers, 2002). Studies were included if children were reported as developing typically, late-talking or as having only a specific speech/language issue because these studies could reveal important information about PR as an associated factor to child language development.

Children identified with confounding factors such as syndromes, global developmental delays or disorders, Autism Spectrum Disorder, or hearing impairment were not included. Children who were reported as preterm or low birth weight (born before 37 weeks gestation or weighing less than 2500 g) were not included because these infants have been identified as having greater risk of language delays in childhood (Cusson, 2003; Magill-Evans & Harrison, 2001) thereby possibly introducing confounding factors. If a study was a comparative cohort or case control that involved typically developing samples as well as samples with confounding factors, only data from the typically developing group were included.

## **Phenomenon of interest.**

Contingent responsiveness, defined as *a degree or frequency of response to a child's cues or activities; including promptness and appropriateness of parental reactions, as well as appropriate pace that fits the child's abilities* (Bornstein et al., 2008; Landry, Smith, & Swank, 2006; Tamis-LeMonda et al., 2001) is the phenomenon of interest. This definition was not specified in the protocol but offers the advantage of maintaining conceptual similarity for data synthesis. Studies were included if their definition of PR was the same, or very close to the presenting definition. Studies that defined responsive parent behaviors at a more granular level (i.e., they measured *specific types* of responses such as parents' question-asking, or labeling) or a global level (i.e., assigning one overall score that reflects parents' performance on more than one conceptually different aspect of responsiveness, such as emotional warmth *plus* labeling) were not included in order to maintain conceptual homogeneity. Studies could investigate CR in the home, clinical, educational or laboratory settings. General parent input that was not explicitly described as prompt, contingent or appropriate was not included - for example, general measures of child directed speech such as parents' total amount of words spoken in 10 min of interaction with their child.

## **Types of studies.**

The review considered randomized controlled studies, quasi-randomized trials and quasi-experimental studies, prospective and analytical observational studies including retrospective cohort studies, case control studies and analytical cross-sectional studies. The search strategy follows the essence of The Joanna Briggs Institute (JBI) methodology for conducting systematic reviews (JBI, 2014), which aims to find the *best available* research evidence beyond the gold standard Randomized Controlled Trials (RCTs). Given meaningful and appropriate evidence can be obtained from observational studies to answer

designed research studies (e.g., comparative cohort), if they happen to be the best available research evidence.

### **Types of outcomes.**

The review considered studies that included children's prelinguistic and language outcomes, which were measured through standardized assessments, parent report or researcher-designed coding systems. Specific language subtests within more general cognitive assessments were accepted as an outcome measure only if the language data could be extracted independently of other cognitive functions. Prelinguistic and language outcomes could include, but were not limited to: speech sound perception, early vocalizations, infant attention, comprehension and production of words and phrases, mean length of utterance in words (MLUw) or morphemes (MLUm), and age of acquisition of key language milestones (e.g., production of first word, 50-word vocabulary, first two-word utterance).

### **Data Evaluation**

#### **Search strategy.**

Prior to a systematic search of databases, an initial limited search of MEDLINE was undertaken using the terms *language development*, *infant*, *parent*, and *responsiveness*, in order to identify a comprehensive list of potential keywords and indexing terms for the main search.<sup>3</sup> Keywords, indexing terms and words from the researchers' clinical expertise and knowledge of language and parenting terminology were then entered into Medical Subject Headings (MeSH) to determine whether they would be exploded for the main search, based on the relevance of further terms found in the MeSH trees. Keywords and index terms were explored in MeSH until saturation point.

The main search strategy aimed to find both published and unpublished studies in the English language using search logic grids with key words categorized in one of four areas: (1) Language Development, (2) Parents, (3) Infant, and (4) Responsiveness (an example can be found in Appendix A). The databases searched from their inception until January 2013 were: PubMed, PsycINFO, CINAHL, Embase, ERIC (ProQuest), Cochrane Database of Systematic Reviews, Campbell Collaboration, SCOPUS, Web of Science, ProQuest Linguistics and Language Behavior Abstracts (LLBA), Mednar, ProQuest Dissertations and Theses, ProQuest Sociological Abstracts, Networked Digital Library of Theses and Dissertations (NDLTD), and Electronic Theses Online Service (EThOS). Where necessary, indexing terms, key words and word combinations in the search strategy were adjusted, dependent on the sophistication and requirements of the databases. Automated alerts were set for PubMed and CINAHL.

### **Screening for eligible studies.**

The search process identified a total of 9559 papers, resulting in 7113 titles being reviewed after removing duplicates. Figure 1 summarizes the study selection process. Based on their titles and abstracts, 342 papers were identified for detailed examination of full text, including ten studies from automatic alerts beyond the main search date. Twenty-nine of these papers (theses) were unable to be retrieved in full text (despite measures such as librarian-assisted interlibrary searching, and contacting authors), and 300 papers were excluded for not fully meeting inclusion criteria, leaving 13 papers for critical appraisal. After examination against JBI critical appraisal tools (JBI Meta Analysis of Statistics Assessment and Review Instrument, JBI-MAStARI) by the first author and another independent reviewer trained in JBI methods, 12 papers qualified for inclusion in the systematic review based on their methodological quality. Any disagreements that arose between reviewers were resolved through discussion. Nine studies were amenable to meta-

analysis – five reported a correlation coefficient between CR and receptive vocabulary outcomes so were included in the first meta-analysis, and four compared CR input for typically developing versus language-delayed children.

### **Data collection.**

Data extracted from the included studies covered: reference information (e.g., title, authors, publication year), geographical and cultural contexts (e.g., study location), sample characteristics (sex and age of parents and children, socio-economic and education status of parents, comparators [if relevant] etc.), study design, details relating to terms, definitions and examples (where given) used to describe and operationalize CR, details about the tools used to measure language outcomes, and statistical information for input and output measures (means, standard deviations) and their relationship (e.g., correlation coefficients, regressions, loglinear analysis).

### **Methods of Analysis.**

Two meta-analyses were conducted – one synthesizing descriptive studies (Meta-analysis 1) and the other, comparative cohort studies (Meta-analysis 2). The use of random effects model was set a priori due to variability in study methods and samples. The correlation coefficient was the common metric chosen to represent the association between CR and children's language outcomes in Meta-analysis 1 because: (1) data reported as descriptive statistics (sample means and standard deviations derived from different language measures) could not be combined in meta-analysis; and (2) this minimizes the effect of the variation of different ages and tools of language assessment across studies.<sup>4</sup> By using the correlation coefficient, correlations from different studies derived from different language tools at different ages can be combined in meta-analysis, provided the tools measure the same construct as demonstrated by their construct validity or correlations

between tools.<sup>5</sup> When studies included more than one time-point of CR or language assessment, only correlations derived from the first time-point were included, to increase statistical robustness by eliminating the possibility of practice or training effects. In the case of observing parents' CR, an exception was made when studies reported explicitly that parents were unaware that observers were interested in their parenting behaviors during dyadic interactions (e.g., Bornstein & Tamis-LeMonda, 1997). Effect sizes for Meta-analysis 2 are expressed as the SMD of CR between typically developing and language-delayed children. Using the SMD allows for synthesis of data, which was derived from different child language and parenting assessment tools.

A one-study-removed analysis was performed on the pooled data in both meta-analyses to examine the effect of studies with outlier effect sizes. Given limitations in study numbers, publication bias was not performed because it is not advisable for fewer than 10 studies (using Egger's Regression; Egger, Smith, Schneider, & Mider, 1997; Rothstein, Sutton, & Bornstein, 1996). All analyses were performed using Comprehensive Meta-Analysis, version 2.2.064 (Biostat, 2011) based on a random effects model using a DerSimonian and Laird method. Data unsuitable for inclusion in either meta-analysis is presented in narrative synthesis.

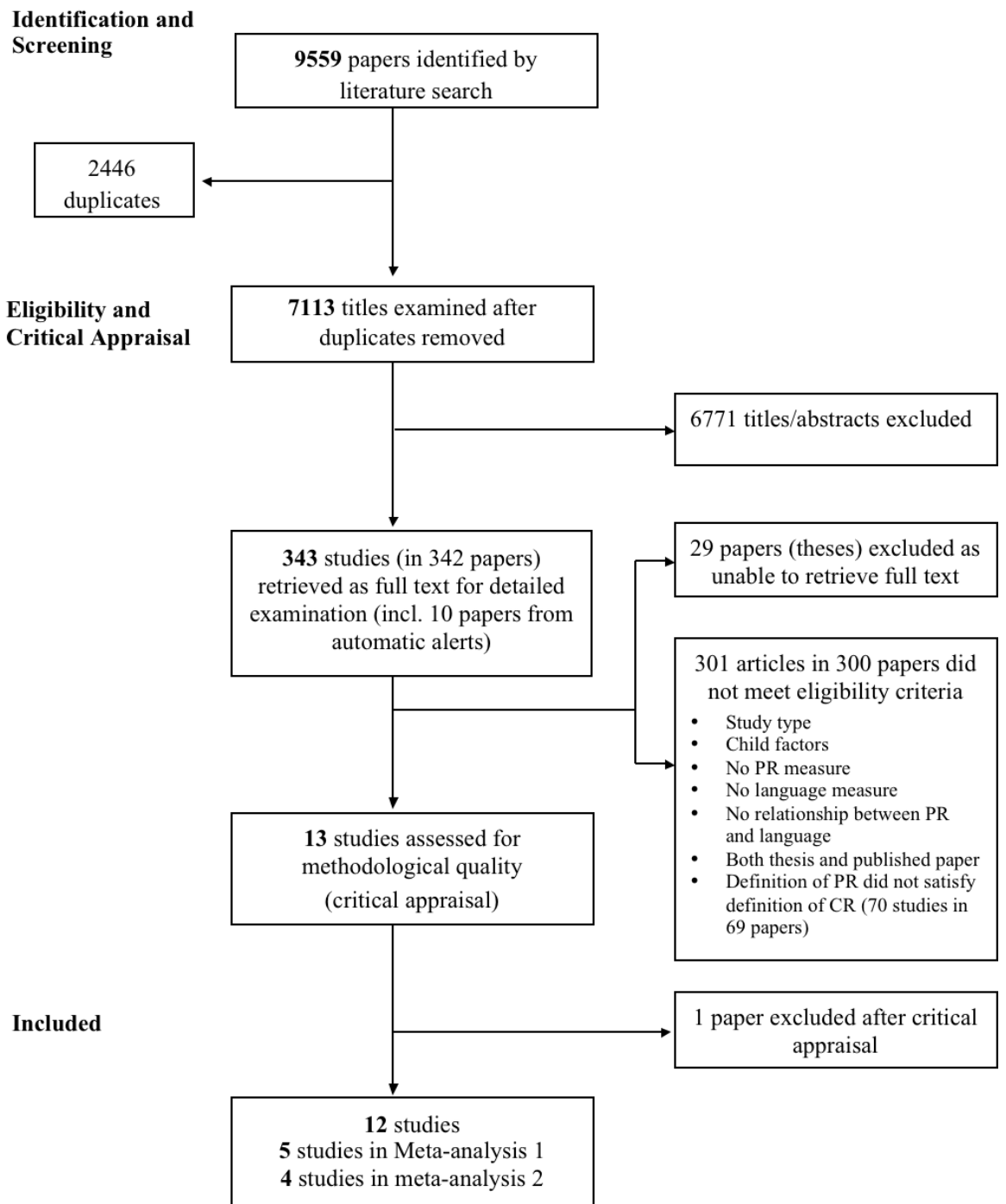


Figure 1. Flow chart of screening process. PR = parental responsiveness. CR = contingent responsiveness (narrower definition used in eligibility criteria).



## **Results**

### **Description of Included Studies**

#### **Study selection and general characteristics.**

An overview of general characteristics and demographics for included studies is displayed in Table 1 (for more detailed information about study demographics and the conceptualization and operationalization of CR, see Appendices B and C respectively). Of the 12 studies, two were experimental, four were prospective comparative cohort (comparing groups of typically developing and language-delayed children), and six were descriptive (prospective longitudinal observational cohort). A total of 558 children and 669 parents were involved in observations of parent-child interactions, which predominantly occurred with mothers (79%).<sup>6</sup> An accurate numerical representation of girls and boys was not possible because sex was not specified for half of the total child sample. Participants were recruited from four countries (USA, Japan, Finland and UK) with most being speakers of English, from the USA. When reported, parent education was generally at high school or tertiary level, and socioeconomic status was generally middle to upper-middle class.

#### **Assessment methods.**

##### ***Contingent responsiveness.***

A total of 25 events of assessing CR were extracted from the 12 studies. CR was predominantly observed in children's homes in the context of play or naturalistic parent-child interaction (usually with toys present), with the exception of a cooking context (Hoffer & Bliss, 1990) and experimental conditions (Goldstein & Schwade, 2008; Masataka, 1993). The duration of most observations was between three and 15 minutes, with the exception of four studies that obtained CR measures from 30 to 60 minutes of

observation (Alston & James-Roberts, 2005; Bornstein et al., 1990; Goldstein & Schwade, 2008; Hoffer & Bliss, 1990) and one study from more than 60 minutes (Coates & Lewis, 1984). Samples were then transcribed and coded either using a customized coding system ( $n = 10$  studies, 83.3%) or modification of a pre-existing coding system.<sup>7</sup> Parents' CR was operationalized either as a frequency or proportion ( $n = 10$  studies, 83.3%), or on a scale of low to high levels (Alston & James-Roberts, 2005; Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). Children ranged in age from 0;3 to 2;11, with 60% of CR assessments occurring across the ages of 0;3 to 1;3, and 40% occurring across the ages of 2;0 to 3;3. No assessments of CR were conducted when children were aged 1;3 to 2;0.

### ***Language.***

The focus of language outcomes varied across studies. Useable outcomes from experimental and descriptive studies were extracted for prelinguistic skills ( $n = 4$  studies; Bornstein et al., 1990; Bornstein & Tamis-LeMonda, 1997; Goldstein & Schwade, 2008; Masataka, 1993); receptive vocabulary ( $n = 6$  studies; Bornstein et al., 1990; Bornstein & Tamis-LeMonda, 1997; Coates & Lewis, 1984; Paavola, Kunnari, Moilanen, & Lehtihalmes, 2005; Tamis-LeMonda et al., 1998; Tamis-LeMonda et al., 2004); expressive vocabulary ( $n = 2$  studies; Paavola et al., 2005; Tamis-LeMonda et al., 1998); receptive syntax ( $n = 1$  study; Paavola et al., 2005); expressive syntax ( $n = 1$  study; Tamis-LeMonda et al., 1998); and pragmatics ( $n = 1$  study; Paavola et al., 2005). Comparative cohort studies used only expressive language criteria for categorizing children into typically developing or language delayed groups (even if outcomes for other language areas were provided) with the exception of one study, in which expressive and receptive emergent language abilities were used to determine whether infants were at risk or not at risk of language delay (Alston & James-Roberts, 2005).

Language was assessed using standardized language tests or a language subtest of a standardized cognitive or developmental test ( $n = 8$  events from seven studies and  $n = 3$  studies respectively) unless outcomes were: supplemented by data from language samples (e.g., MLU, number of words;  $n = 3$  studies); assessed by age of attainment of language milestones ( $n = 1$  study); or involved prelinguistic skills ( $n = 4$  studies). Across the 12 included studies, children ranged in age from 0;3 to 6;0 at the time language was assessed. Assessment commonly occurred in the first two years of life ( $n = 11$  events of language assessment, 64.7%), particularly at 0;8 to 1;3 ( $n = 6$  events of language assessment; 35.3%).<sup>8</sup>

### **Methodological quality of included studies.**

To be included in this review, studies were required to meet quality criteria relating to reliable measurement of outcomes and use of appropriate statistical analyses in addition to meeting a minimum total number of quality criteria (i.e., at least five out of a possible nine or 10, depending on the study design). Studies generally did well in reporting confounding factors, reliability of outcome measures, statistical analyses used and minimizing possible biases. Generally, studies could improve their reporting of explicit inclusion criteria, sampling procedures, geographic demographics and reasons for and outcomes of participants who withdrew. A more detailed description of assessments of methodological quality per study design type can be found in Appendix D.

### **Synthesis of Included Studies - Main Findings**

The findings focus on the association between CR and language development and are categorized under language outcome types – prelinguistic skills (attention, early vocalizations), receptive vocabulary, expressive vocabulary, receptive syntax, expressive syntax, pragmatics and phonological awareness. An outline of which studies provided

useable data for different language areas is presented in Table 2. Results are synthesized within these categories, in narrative form, with the exception of two meta-analyses and synthesis of comparative cohort data. The first meta-analysis examines the relationship between CR and receptive vocabulary, with pooled and overall effects (from observational studies) expressed as a correlation coefficient. The second meta-analysis synthesizes the standard mean differences from comparative cohort studies examining parental CR across groups of children who had either typically developing or delayed expressive language.

Table 1

*Summary Characteristics of Included Studies*

Variable	Category	<i>n</i>
Study Characteristic		
Location	USA	8
	Finland	1
	UK	1
	Japan	2
Publication date	1980s	1
	1990s	6
	2000s	5
Study design	Randomized control trial	2
	Descriptive (longitudinal observational)	6
	Comparative cohort	4
Children	Total	558
	Boy	164
	Girl	114
Parent involved	Not specified	280
	Total	669
	Mother only	529
	Father only	111
	Not specified	29
Contingent Responsiveness	Total events of CR measured	25
Age CR observed <sup>b</sup>	0;0 - 0;7	7
	0;8 -1;3	8
	1;4 -1;11	0
	2;0 - 2;7	4
	2;8 - 3;3	6
Measurement method	Author's coding system	10
	Adaptation/modification of others	2
	Frequency	10
	Scale	2
Length of observation	0 - 15 min	7
	30 - 60 min	4
	> 60 min	1
Activity	Play	8
	Standard Set of Toys used	7

Variable	Category	<i>n</i>
Setting	Naturalistic/usual daily tasks	4
	Other (e.g., cooking, experimental condition)	3
	Home	9
	Laboratory or clinic	3
Language		
Age assessed <sup>b</sup>	0;0 - 0;7	3
	0;8 - 1;3	6
	1;4 - 1;11	2
	2;0 - 2;7	3
	2;8 - 3;3	2
	3;4+	1
	Non-standardized	Frequency, duration or quality of prelinguistic skills
Age of attainment of language milestone(s)		1
Standardized	Language samples (e.g., MLU, number of words)	3
	MacArthur Communicative Developmental Inventory (MCDI)	1
	Rescorla's Language Development Survey (LDS)	2
	Early Language Interview (ELI)	1
	Peabody Picture Vocabulary Test (PPVT)	2
	Communication and Symbolic Behavior Scales (CSBS)	1
	Ward Infant Language Screening Test, Assessment, Acceleration and Remediation (WILSTAAR) confirmed by Receptive and Expressive Emergent Language scale (REEL)	1
Language subtests	Expressive language subtest of Minnesota Child Development Inventory	1
	Vocabulary subtest of Wechsler Intelligence Scale for Children-Revised (WISC)	1
	Language subtests of Mullen Scales of Early Learning (MSEL)	1

*Note.* CR = contingent responsiveness.

<sup>a</sup> Language outcomes include prelinguistic measures. <sup>b</sup> Data on CR and language measures are clustered by age groups based on the onset of language development milestones: 0;0 - 0;7: onset of prelinguistic skills such as reduplicated babble and pre-intentional communication (Fagan, 2009); 0;8 - 1;3: onset of intentional communicative acts such as joint attention, pointing, word comprehension and word production (Adamson, Bakeman, & Deckner, 2004; Fagan, 2009; Muneton Ayala & Rodrigo Lopez, 2011); 1;4 - 1;11: onset of the "word spurt" which is a period of rapid growth in vocabulary (Goldfield & Reznick, 2009; McEachern & Hanynnes, 2004), 50 words productive vocabulary, and onset of two-word combinations (McEachern & Hanynnes, 2004) ages beyond 1;11 were clustered by 8-month blocks for consistency rather than reasons pertaining to developmental milestones.

Table 2

*Overview of language areas covered by included studies*

Study	Language assessments used (age in months)	Prelinguistic		Expressive		Receptive		Pragmatic
		Attention	Vocalisation	Word	Phrase	Word	Phrase	
Experimental								
Goldstein & Schwade	Frequency count for number of vocalisations, imitation and phonology (0;9)		+					
Masataka	Frequency count (0;3 and 0;4)		+					
Comparative Cohort								
Alston & St James-Roberts, 2005	WILSTAAR and REEL (0;10)			+		+		
Hoffer & Bliss 1990	MCDI <sup>a</sup> ( $M_{\text{typical}} = 2;0$ ; $M_{\text{delayed}} = 34.8$ )			+				
Paul & Elwood, 1991	LDS ( $M_{\text{delayed}} = 2;1.3$ .; $M_{\text{typical}} = 2;1.15$ )			+	+			
Vigil, 2005	LDS, Language samples, MSEL (2;0-2;5) <sup>b</sup>			+	+			
Descriptive								
Bornstein et. al., 1990	Frequency (0;5), PPVT (2;8)	+	+			+		
Bornstein & Tamis-LeMonda, 1997	Duration (1;1), ELI (1;1)	+				+		
Coates & Lewis, 1984	WISC vocab subtest (6;0)					+		
Paavola et. al., 2005	MCDI (1;0), CSBS (1;0)			+		+	+	+
Tamis-Lemonda et. al., 1998 <sup>b</sup>	Language milestones			+	+	+		
Tamis-LeMonda et. al., 2004	PPVT (3;0)					+		

*Note.* Frequency and Duration are terms used to describe the methods for assessing attention and/or vocalization; WILSTAAR = Ward Infant Language Screening Test; Assessment, Acceleration and Remediation; MCDI = MacArthur Communicative Developmental Inventory; PPVT = Peabody Picture Vocabulary Test; ELI = Early Language Interview; WISC = Wechsler Intelligence Scale for Children-Revised; LDS = Rescorla's Language Development Survey; CSBS = Communication and Symbolic Behavior Scales; MSEL = Mullen Scales of Early Learning.

<sup>a</sup>MCDI for this citation refers to Minnesota Child Development Inventory. <sup>b</sup>This study also used other forms of language assessment but because they based grouping on expressive language milestones only the expressive word and phrase categories are indicated in the table.

## **CR and prelinguistic skills.**

The prelinguistic areas of attention and early vocalization were assessed in relation to CR by a total of four included studies. The findings regarding the influence of CR towards children's attention skills is limited to two studies that cannot be statistically combined because they differ in their populations and in the way attention is defined and measured (i.e., mother vs. toys; frequency vs. duration). However a cautious statement is made about the influence of parental CR occurring at five months old, given both studies assessed input at this age and found statistically significant associations with attention skills.

CR at 0;5 contributed towards the duration of attention to toys at 0;5 (Bornstein et al., 1990) and the frequency of attention to mothers at 12;1 (Bornstein & Tamis-LeMonda, 1997). Bornstein and Tamis-LeMonda (1997) investigated the association between CR at 0;5 and 1;1 with mother-orientated visual attention at 1;1 (i.e., looks to mother) in 40 American mother-child dyads.<sup>9</sup> A statistically significant association was found between CR at 0;5 with children's attention at 1;1 (i.e., predictive;  $r = .43, p < .01$ ), but not for concurrent relations at 1;1 ( $r = .22$ ). In a study involving 31 Japanese mother-child dyads, a concurrent association between CR and attention to toys at 0;5 was found ( $r = .30, p < .05$ . Bornstein et al., 1990).<sup>10</sup> It could be inferred from these results that parental CR to five-month-olds contributes toward the development of attention skills, possibly highlighting an age at which infants are particularly responsive to their parents' tuned-in behaviors. However, it is important to remember that the correlational nature of the data cannot imply causality and may reflect the interconnection between parent and infant influences during interactions.

Studies have also shown that infants make changes to their prelinguistic vocalizations in response to parental CR. In one observational study, the amount of

nondistress vocalizations produced by 31 five-month-old Japanese infants was associated with mothers' concurrent CR to their nondistress activities ( $r = .45, p < .01$ . Bornstein et al., 1990). In other studies of experimental design, nine-month-old infants modified the phonological characteristics of their babbling when mothers responded with contingent vocalizations (Goldstein & Schwade, 2008), and mothers' contingent vocalizations to three- and four-month-olds influenced the quality and timing of their vocalizations (Masataka, 1993).

In the study by Goldstein and Schwade (2008), mothers' verbal responses were manipulated to be either contingent or non-contingent to infants' babbles while receiving the same amount of non-verbal warmth from their mother (i.e., moving closer, smiling, touching). Thirty infant-mother dyads were randomly assigned to one of two contingent feedback groups (15 mothers instructed to speak in clear, open [fully resonant] vowels and 15 in consonant-vowel [CV] combinations), and another 30 matched into yoked control groups. This means vocalizations of control group mothers were direct imitations of their paired contingent mother via CD instruction. In this way, the infants in the control groups received identical but non-contingent exposure to maternal utterances and intonation as the paired contingent dyad. Infants receiving contingent, fully resonant, parent vocalizations increased in the proportion of open vowel sounds produced across the test periods (Tukey's HSD,  $p < .05$ ). They also produced significantly more vocalizations during testing compared to baseline periods (Tukey's HSD,  $p < .05$  [Baseline 1 to Testing];  $p < .01$  [Testing to Baseline 2]), but did not change in the proportion of CV-structured vocalizations. Infants receiving contingent, CV-structured parent vocalizations increased the proportion of CV-structured vocalizations (Tukey's HSD,  $p < .05$ ), but did not show a significant change in the production of resonant sounds or the number of vocalizations. Infants in the control group did not alter the phonological characteristics of their babbling



although they did increase their amount of vocalizing from baseline to testing period, which the authors suggest may be due to arousal from non-contingent reinforcement.

Similarly in another experimental study involving 48 mother-infant dyads, mothers were randomly assigned to respond (saying *Hi [name]* simultaneous with a smile and light touch) either contingently or randomly to their three- and four-month-old infants' vocalizations (Masataka, 1993). Contingent responses occurred only after an infant vocalization, and random responses were based on the schedule of contingent responses, making them identical in manner and timing, but non-contingent on the timing of infants' vocalizations. Contingency was found to affect infants' quality and timing but not rate of vocalization. A statistically significant difference was found during the 6 min testing period, for the quality of sounds produced by contingent- and random-schedule infants, with infants who received CR producing more complex, speech-like sounds at 0;3 and 0;4.<sup>11</sup> An ANOVA in the difference between contingent-schedule and random-schedule 0;3 groups was significant at 0.05 (proportion of syllabic sounds = 55.5 and 41.0 respectively). An ANOVA in the difference between 0;4 contingent-schedule and random-schedule groups was significant at 0.05 (proportion of syllabic sounds = 59.2 and 35.0 respectively).

### **CR and receptive vocabulary.**

The association between CR and receptive vocabulary was explored in six studies, of which, five were included in Meta-analysis 1 (Bornstein et al., 1990; Bornstein & Tamis-LeMonda, 1997; Coates & Lewis, 1984; Paavola et al., 2005; Tamis-LeMonda et al., 2004) and two were analyzed using narrative synthesis (Tamis-LeMonda et al., 1998; Tamis-LeMonda et al., 2004).<sup>12</sup>

## ***Meta-analysis 1.***

### *Overall correlation and effect sizes.*

A positive medium-sized association was found between parents' CR to children in the first two years of life and children's receptive vocabulary development, indicated by a statistically significant overall effect size of  $r = .22$ , 95% CI [0.02, 0.40],  $p < .05$ ,  $N = 245$  dyads,  $Z = 2.17$ ).<sup>13</sup> However there was large within- and between-study variability. As such, additional studies are required to confirm if the result is generalizable. Effect sizes, confidence intervals and significance values regarding the association between CR (age range: 0;3-2;0) and receptive vocabulary development (age range: 1;0-6;0) are displayed in Table 3. Correlation coefficients ranged from  $-.24$  to  $.38$ .

### *Sensitivity analysis.*

One study (Paavola et al., 2005) was identified as having an outlying effect size in the negative direction ( $r = -.24$ ).<sup>14</sup> A one-study-removed analysis (random effects model) was performed on the pooled data to examine the influence of this study on the overall effect size. The analysis yielded a larger effect size of greater statistical significance ( $r = .31$ , CI [0.20, 0.42],  $p < .01$ ) when Paavola et al (2005) was removed from the pooled data compared to when it was included ( $r = .22$ , CI [0.02, 0.40],  $p < .05$ ). This result suggests the existence of an outlier effect by which the inclusion of this study reduces the strength and statistical significance of the association between CR and receptive vocabulary development.

Table 3

*Combined effect size for correlation analysis of the association between CR and receptive vocabulary development (random effects model) – Meta-analysis 1*

Citation	CR label (age)	Language tool (age)	Effect ( <i>r</i> )	95% CI	<i>n</i>	<i>p</i>
Bornstein et al. (1990)	Contingent response to infant non-distress (0;5)	PPVT (2;8)	.14	[-0.23, 0.47]	31	.46
Bornstein and Tamis-LeMonda (1997)	Responsiveness to infant non-distress (0;5 and 1;1) <sup>a</sup>	ELI (1;1)	.21	[-0.03, 0.43]	36	.08
Coates and Lewis (1984)	Vocal responsivity (0;3)	WISC (6;0)	.38*	[0.08, 0.62]	40	.02
Paavola et al. (2005)	Maternal verbal responses (0;10)	MCDI (1;0)	-.24	[-0.57, 0.15]	27	.23
Tamis-LeMonda et al. (2004) <sup>b</sup>	Sensitivity (2;0)	PPVT (3;0)	.38***	[0.21, 0.53]	111	<.01
Total			.22*	[0.02, 0.40]	245	.03

*Note.* Publication bias not determined due to low number of studies or similar study size. Tau = 0.169. Age is reported in months; *r* = correlation coefficient; CI = confidence interval; *LL* = lower limit; *UL* = upper limit; PPVT = Peabody Picture Vocabulary Test; ELI = Early Language Interview; WISC = Wechsler Intelligence Scale for Children – Revised; MCDI = MacArthur Communicative Developmental Inventory.

<sup>a</sup> The combined effect from two time-points is presented. This was possible because study methods reduced the likelihood of a practice effect.

<sup>b</sup> Statistics from mothers only are used in the meta-analysis – associations involving fathers are described narratively.

\**p* < .05, \*\*\**p* < .001.

### **Narrative synthesis of data not included in Meta-analysis 1.**

Predictive relations between CR at specific time-points across the first two years of life and receptive vocabulary development at 1;5 and 3;0 were found by two independent studies. In a sample of 40 American middle to upper-middle class mother-child dyads, Tamis-LeMonda et al. (1998) found a predictive relationship between CR at both 0;9 and 1;1 and the mean age at which children understood their first 50 words<sup>15</sup> (1;5.27; CR at 0;9: *r* = -.44; CR at 1;1: *r* = -.42, [*p* < .01]). The negative, statistically significant correlations indicate that children achieve this milestone sooner when they are exposed to higher levels of mothers' CR at 0;9 and 1;1.<sup>16</sup> In another study, fathers' CR at 2;0 was

predictive of receptive vocabulary at 3;0 (measured by PPVT;  $r = .26, p < .001$ ; Tamis-LeMonda et al., 2004). This study also found positive, statistically significant concurrent correlations between mothers' and fathers' CR with PPVT scores at 3;0 (mothers:  $r = .27, p < .001$ ; fathers:  $r = .22, p < .01$ ). That is, both mothers' and fathers' CR separately were significantly associated with children's receptive vocabulary at age three years.<sup>17</sup>

### **CR and expressive vocabulary.**

The association between CR and expressive vocabulary was explored in two studies, with differing results. Tamis-LeMonda et al. (1998) found that CR at 0;9 and 1;1 were each significant predictors of two expressive vocabulary milestones – the age at which children achieved first words in production ( $r = -.52, p < .001$ ;  $r = -.44, p < .01$  respectively) and 50 words in production ( $r = -.42, p < .01$ ;  $r = -.52, p < .001$  respectively). They further assessed the unique contributions of each predictor to the timing of 50 words in production using chi-square goodness-of-fit indices and found that CR at 1;1 contributed unique variance in explaining the timing of children's achievement of a 50-word expressive vocabulary, over and above other predictors, including previous child language levels.<sup>18</sup> Contingent responsiveness at 0;9 was not found to be a unique predictor of the timing of 50 words in productive vocabulary, however CR at 0;9 predicted the timing of other linguistic competencies as well as CR at 1;1, which, in turn, predicted when children achieved 50-word expressive vocabulary. Therefore, although CR at 0;9 was not a unique predictor of this language milestone, it is possible that it had an indirect effect through other predictive variables.

Paavola et al. (2005) correlated a variety of mother's responsive behaviors towards ten-month-olds to their productive vocabularies at 1;0 taken from parental reports using the MCDI. The parent behavior that adhered to the systematic review's definition of CR was termed *fillers* – a contingent automatic response such as *Uh oh; Mm* that does not convey

referential meaning. This type of CR was found to be negatively, and non-significantly correlated with productive vocabulary ( $r = -.21$ ) in their sample of 27 Finnish-speaking mother-child dyads.

### **CR and receptive syntax.**

One study investigated CR in relation to understanding phrases (Paavola et al., 2005). The correlation between CR (fillers) at 0;10 and phrases understood at 1;0 (measured by the MCDI) was found to be non-significant ( $r = -.19$ ).

### **CR and expressive syntax.**

One study explored the association between CR and expressive syntax, measured by the age when first combinatorial speech was achieved (mean age = 1;6.21). Tamis-LeMonda and colleagues (1998) found that CR at 0;9 and 1;1 were each significant predictors of this milestone ( $r = -.49$ ,  $r = -.57$  respectively,  $p < .001$ ). The authors then investigated the unique contributions of each predictor for this language outcome through chi-square goodness-of-fit and found that CR at 1;1 contributed unique variance in explaining the timing of children's achievement of combinatorial speech, over and above other predictors including previous child language levels.<sup>19</sup> CR at 0;9 contributed unique variance over two other predictors (timing of first imitation and 50 words in receptive language) but not over the timing of first words in production or CR at 1;1. However, as with the language outcomes pertaining to expressive vocabulary in the same study, the authors suggest that CR at 0;9 is mediated through first words in production and CR at 1;1, which, in turn, uniquely predicts when children will first combine words.

## **CR and pragmatics.**

Paavola and colleagues (2005) investigated CR (fillers) at 0;10 in relation to the social use of language at 1;0, measured by raw cluster scores of the Communication and Symbolic Behavior Scales (CSBS). Statistically significant inverse correlations were found between CR and CSBS subsections of *Communicative Function* and *Social-affective Signaling* ( $r = -.38$  and  $-.48$  respectively,  $p < .05$ ). No other statistically significant associations were found between CR and CSBS subsection or total scores. As mentioned previously, fillers (e.g., “Uh oh”; “Mm”) technically met the definition of CR to be included in the systematic review, however have a qualitative difference to responsive behaviors included from other studies, in that they do not provide referential meaning.

## **CR from parents of children with typically developing and delayed language – findings from comparative cohort studies.**

All studies that compared CR by language-delayed or typically developing groups of children observed CR in naturalistic play-based context and were included in Meta-analysis 2. One small study by Hoffer and Bliss (1990) also used a baking context, showing that mothers’ total utterance outputs were similar across language-delayed and stage-matched (i.e., matched for language ability, not age) groups but they differed in the way they responded. Mothers of stage-matched children responded to significantly more (48.1%,  $SD = 12.1$ ,  $p < .05$ ) and ignored significantly less (10%,  $SD = 7.3$ ,  $p < .01$ ) of their children’s total utterances than mothers of language-impaired children (33.2%,  $SD = 9.7$ ; 21.1%,  $SD = 12.1$  respectively). These differences were still found even though the baking context was reportedly less sensitive to differences in maternal CR because it was more structured and goal-directed.

## ***Meta-analysis 2.***

Children with typically developing language ( $n = 97$ ) were found to experience greater levels of parental CR heading into, and during, their second year of life compared to those with expressive language delay ( $n = 88$ ). The overall combined effect size (standard mean difference) indicates a large statistically significant difference between the levels of parental CR experienced by the two groups of children<sup>20</sup> (SMD = .81, 95% CI [0.33, 1.28],  $p = .001$ ). However there was large within- and between-study variability. As such, additional studies are required to confirm if the result is generalizable. Removal of any one of the studies did not significantly affect the outcome of the analysis. Effect sizes ranged from 0.19 (lower CR) to 1.81 (greater CR). Table 4 presents descriptive data, effect sizes, confidence intervals and significance values for the four included studies. The average age that CR and language measures were taken (concurrently) was 1;9.24 for typically developing children (range: 0;10 to 2;1.21) and 2;5.24 (range: 0;10 to 3;8) for children with delayed language.

Table 4

Combined effect size for mean difference analysis between typically developing and language-delayed samples (random effects model) – Meta-analysis 2

Citation	CR label	CR levels – raw data								<i>SMD</i>	<i>SE</i>	95% CI	<i>p</i>
		Typically developing				Delayed							
		<i>M<sub>age</sub></i>	<i>n</i>	<i>M</i>	<i>SD</i>	<i>M<sub>age</sub></i>	<i>n</i>	<i>M</i>	<i>SD</i>				
Alston and James-Roberts (2005)	Maternal sensitivity	0;10	30	8.62	1.39	0;10	30	7.47	1.18	0.89	0.27	[0.36, 1.42]	.001
Hoffer and Bliss (1990)	General maternal responsiveness - toy play <sup>a</sup>	2;0	10	57.50	12.20	3;8	10	45.50	14.40	0.90	0.47	[-0.21, 1.81]	.006
Hoffer and Bliss (1990)	Percent ignore child initiatives – toy play <sup>b</sup>	2;0	10	6.30	4.60	3;8	10	15.10	5.10	1.81	0.53	[0.77, 2.85]	.001
Paul and Elwood (1991)	Responses to child's bid for attention	2;1.15	28	0.80	2.00	2;1.3	28	0.50	1.00	0.19	0.27	[-0.34, 0.72]	.479
Vigil, Hodges, and Klee (2005)	Proportion of responses to child initiations	2;1.21	19	0.94	0.82	2;1.21	10	0.43	0.28	0.74	0.40	[-0.05, 1.53]	.066
Total		1;9.25	97			2;5.22	88			0.81	0.24	[0.33, 1.28]	.001

Note. Publication bias not determined due to low number of studies or similar study size. Tau = 0.389. *M<sub>age</sub>* = mean age; *SMD* = standard mean difference; *SE* = standard error; CI = confidence interval; *LL* = lower limit; *UL* = upper limit.

<sup>a</sup>Hoffer and Bliss also observed *responsiveness* and *ignore* in a cooking context but this was excluded from meta-analysis in order to maintain consistency of an 'unstructured or semi-structured play' context across studies. <sup>b</sup>*M* and *SD* for *Percent ignore child initiatives* were inverted prior to data entry into the meta-analysis therefore *SMD*, *SE*, *CI* and *p* are based on the inverted data for this label.



## **Discussion**

### **Summary of main findings**

This systematic review provides a new level of evidence regarding a connection between parental CR towards zero- to three-year-olds, and the acquisition of children's language skills. The best available research was reviewed, and supports the general conclusion that parental CR and several domains of children's language development are associated – namely, infant attention, the quality and amount of infant vocalizations, receptive and expressive vocabulary, and expressive syntax. This systematic review also models the use of innovative methods for conducting meta-analysis of a complex and varied dataset in which different language assessment tools and ages exist.

Parents' CR during interaction with infants aged 0;3 to 0;9 was associated with prelinguistic vocal and attentional development in the studies reviewed. Contingent responsiveness seemed to have particular connection to infant attention when occurring at the age of five months old. When delivered at this age, CR was associated with five-month-olds' object-directed attention (Bornstein et al., 1990) and thirteen-month-olds' mother-directed attention (Bornstein & Tamis-LeMonda, 1997). The ability to attend to adult speech while jointly focusing on objects or people provides word-learning opportunities because it enables infants to link sounds to objects (Gros-Louis, West, & King, 2014), and a recent study showed that infants' attention to speech at 1;0 predicted expressive vocabulary measures at 1;6 (Vouloumanos & Curtin, 2014). Hence, CR at 0;5 may indirectly lay the foundations for future language development.

In relation to infant vocalizations, the overall results from two experimental studies and one observational study suggest that infants adjust the quantity (Bornstein et al., 1990), phonological quality (Goldstein & Schwade, 2008; Masataka, 1993) and timing (Masataka,

1993) of their vocalizations in response to parents' CR. Another recently published small longitudinal study showed mothers' CR to infants' vocalizations was correlated to the growth of the infants' mother-directed vocalizations from 0;8 to 1;2 (Gros-Louis et al., 2014). Although limited to a small number of studies, these results suggest with some level of confidence, that parents' CR has a direct influence on infant vocalization at 0;3, 0;4, and 0;9, given the two experimental studies were designed to isolate CR as the variable under question and remove the potential influence of child variables. In other words, by randomizing samples in the experimental designs, the results limit the possibility that more verbal infants elicit more parental CR, and instead appear to support a finding that parental CR influences early child vocalizations.

In terms of implications, the predictive relationship between prelinguistic skills and later language development and school achievement is not highly researched in generalizable populations, however one study did find correlations between the phonetic complexity of vocalizations in infants with cochlear implants and later receptive vocabulary, articulation abilities, and global language skills at four years old (Walker & Bass-Ringdahl, 2008). Thus it is possible that parents' CR in infancy could potentially influence later language development indirectly through facilitating early vocalizations, however there is limited evidence to support this currently. What can be stated with some level of confidence is that the results from this section of the systematic review indicate that parents' CR towards their infants contributes towards the development of infant attention and vocalizations.

An important and clear finding from this research was that parental CR delivered by two years of age contributed to almost 5% of the variance in receptive vocabulary development, as shown by the meta-analysis examining the association between CR and receptive language. Notably, an even greater effect with greater statistical significance occurred when an identified outlier study was removed, almost doubling the contribution

of CR on the development of receptive vocabulary to 9.49% ( $r = .31, p < .01$ ). The results of the meta-analysis must be viewed in the context that they are not independent from potential confounding factors known to influence vocabulary development (e.g., socio-economic disadvantage, maternal education level) as moderator analysis could not be performed due to limited study numbers. However, these results were corroborated by other studies not included in meta-analysis (for methodological reasons), which found statistically significant medium associations between mothers' and fathers' CR at 2;0 and receptive vocabulary 12 months later (Tamis-LeMonda et al., 2004), and large associations between CR at both 0;9 and 1;1 and achieving comprehension of first 50 words (Tamis-LeMonda et al., 1998). Together, these findings illustrate that parental CR, particularly during infancy to toddlerhood, is associated with children's receptive vocabulary development to a medium to large degree.

This is interesting and important information given children's receptive vocabulary at school entry predicts later reading and literacy abilities (Craig, Connor, & Washington, 2003; Hemphill & Tivnan, 2008). Even vocabulary comprehension at the younger age of three years old is shown to contribute independently to reading comprehension at nine to 11 years (Durand et al., 2013). In their study of several hundred children from low-income families, Hemphill and Tivnan (2008) conclude that children's vocabulary skills at the beginning of first grade contributed critically to later achievement in reading comprehension, and continued to strongly predict reading over the next two years of schooling. Presumably, if parents' contingent responses to their infants and toddlers during play and naturalistic interactions facilitates receptive vocabulary development, they have the potential to place their children in a better position for reading and literacy success at school.

Conclusive statements about associations between CR and expressive vocabulary, receptive syntax, expressive syntax and pragmatics could not be made due to limited

evidence, and no studies examined phonological awareness as an outcome measure. Findings for expressive vocabulary were limited to two studies that were too dissimilar in methodologies to be combined statistically. In one study, CR at 0;9 and 1;1 were both significant predictors of the age at which children spoke their first word, and attained 50 words in production, with CR at 1;1 uniquely contributing to the 50-word vocabulary age over and above other predictors including prior child language ability (Tamis-LeMonda et al., 1998). The other study showed that contingent responses in the form of filler words (e.g., “Uh oh”; “Mm”) did not influence the growth of expressive vocabulary, nor did it facilitate receptive syntax or pragmatics, and in fact had a negative relationship with each of these areas of language development (Paavola et al., 2005). A possible explanation is provided within the section on methodological considerations. The study by Tamis-LeMonda et al. (1998) also provided correlations for CR and expressive syntax, suggesting CR at 0;9 and 1;1 were each significant predictors of the age that children form their first two-word utterance and CR at 1;1 contributed unique variance over and above other predictors. However a comprehensive assessment and conclusion about the effects of CR on expressive syntax cannot be made when this was the only study to present information on the area. Although only two longitudinal studies report correlations between CR and expressive vocabulary outcomes, and only one on expressive syntax, more information could be gleaned from comparative cohort studies, which tended to use children’s levels of expressive vocabulary and syntax as criteria for inclusion into language-delayed or typically developing groups.

One conclusion suggested by the results from the meta-analysis of the comparative cohort studies, is that toddlers with typically developing language were exposed to greater levels of CR than those with expressive language delays, as shown by the large, statistically significant difference in parents’ contingent responses between groups (SMD = .81, 95% CI [0.33, 1.28],  $p < .001$ ). This synthesized finding is based on observations of a

relatively small sample of parents (88 language-delayed and 97 typically developing children), whose behaviors were in keeping with the outlined CR definition, during naturalistic play situations. These findings contribute to the wider discussion about whether a reduced quality of parent interactions contributes towards children's language delay, and/or whether the language-delayed children provide less opportunity for parents to offer contingent responses. Because the analysis is one-directional, in that it examines the relationship between parent and child linguistic behaviors from the direction of parents' CR towards children, and does not take into account the reciprocity of children's language input influencing the frequency of parent responses, conclusions about directionality cannot be made. That is, children with typically developing language could provide more opportunities for parents to offer contingent responses because they offer different qualities or quantities of interactions. However, it is noteworthy that two of the five individual effects that were pooled in the meta-analysis did match typically developing and language-delayed children in their language output (Hoffer & Bliss, 1990), meaning children in both groups provided the same level of linguistic opportunity for parents to respond.

## **Strengths and Methodological Considerations**

Given the conceptual diversity in the literature for the construct of PR, the use of an explicit definition in the inclusion criteria enabled synthesis of conceptually similar data across studies for a robust assessment of its association to language outcomes. Contingent responsiveness was defined as *the degree or frequency of responsiveness to a child's target activities, including promptness and appropriateness of parental reactions, as well as appropriate pace that fits the child's abilities*. This definition was considered a logical and sound starting point because it enabled examination of PR in a sufficiently general way without being too global (e.g., combining very different elements of responsiveness, such as combining measures of *emotional warmth* with levels of parental object/action *labeling*)

or too specific (e.g., only examining one type of parent response, such as a parent *expanding* on a child's previous utterance by adding additional words). By including studies that met the definition of CR, the objective of the review could be addressed, which was to ascertain the extent to which parents' contingent responses, in a general sense, are associated with children's language development.

While using a specific definition is beneficial for enabling conceptual homogeneity, it meant that research papers using other definitions of PR were not included. For example, some studies did observe parenting behaviors that fit the CR definition, but then data (i.e., correlations with language outcomes) could not be extracted from statistical analyses because they were based on several parent behaviors (including behaviors not meeting the definition of CR) that had been combined (with reasonable justification) into summary scores (Baumwell et al., 1997; Tamis-LeMonda et al., 1996). Conversely, other studies were included because their definitions of parent behaviors met the systematic review's definition of CR (e.g., fillers: *Uh oh*, *Mmm*; and *Responses to child's bid for attention: yes?*, *Hmm*), and yet whilst these parent verbalizations were contingent, prompt and appropriate, they may in fact have qualitative differences to contingent responses described in the other included studies (Paavola et al., 2005; Paul & Elwood, 1991).

The study by Paavola et al. (2005) found that associations between filler-type parent contingent responses and children's language measures for receptive vocabulary, expressive vocabulary, receptive syntax and pragmatics had either negative or no statistical significance, and this study was also confirmed as an outlier in Meta-analysis 1 through a one-study-removed sensitivity analysis. These findings suggest filler-type parent responses may have qualitative and functional differences for language development from CR, and perhaps would be better placed in a different section of the PR framework. After closer scrutiny of the qualitative nature of a parent's filler response, and correspondence with the primary author (L. Paavola, personal communication, September 30, 2014) one

explanation could be that filler-type responses, although meeting the definition of CR, may not play a role in facilitating children's communicative and linguistic development because they do not provide a high level of language scaffolding or referential meaning. As a result, these findings provide further insight into the conceptual understanding of the components and categorization of PR.

A novel approach was used to manage and synthesize primary data for language outcomes that were measured by different tools, at different ages or for different aspects of language development. The meta-analytic approach demonstrated in this systematic review involved grouping studies by the elements of language that were conceptually similar, and then utilizing the common metrics such as Pearson's correlation coefficient (observational studies) and SMD (comparative cohort studies) as the effect size index. The use of standardized effect sizes for meta-analysis enabled the synthesis of data from studies associating CR with language outcomes that were obtained through different assessment methods and tools.

Grouping studies in this way also provided insight into the areas of language that received the most or little attention in relation to the specified definition of CR, helping to identify areas of research gaps. Generally, experimental studies focused on the impact of modifying the contingent nature of parent verbal responses on infants' early vocalizations; comparative cohort studies tended to group children into typically developing or language-delayed by criteria relating to expressive language (e.g., less than 50 words or no word combinations by 2;0); and observational studies consistently looked at receptive vocabulary as an outcome measure, with language outcomes of attention, early vocalizations, receptive and expressive syntax, pragmatics and phonological awareness being investigated to a lesser extent or not at all.

## **Future Directions**

The methods used in the current systematic review offer an example for future systematic reviews that choose to examine the association between other aspects of parental responsiveness and children's language development. The search strategy used identified other quality studies that could not be included because they defined and operationalized responsive behaviors at either too global or too granular a level, thus did not satisfy the definition of CR used for this review. By following a similar research protocol, but modifying the definition of the parent behavior in the eligibility criteria, future systematic reviews could examine the association between other types of parents' responsive or non-responsive behaviors (e.g., labeling, expansion, warmth, redirecting) in relation to one or more language outcomes.

Given the heterogeneity of terms and descriptions of responsive parent behaviors observed in empirical studies, the present approach of including studies that meet a specified definition, then organizing the data by language outcomes, and synthesizing data through a combination of narrative and meta-analysis can be re-applied. Furthermore, the present research shows how to obtain an overall measure of the association between contingent parent behaviors and child language (in this case, receptive vocabulary) by using common metrics of correlation coefficients and SMD in meta-analysis. Similar methods could also be applied to examining the association between other types of parent responsive behaviors with language development, through meta-analysis, to provide an overall comprehensive picture of the relative influence of different types of parenting behaviors.

This type of research knowledge is clinically relevant as it could guide which parent behaviors to prioritize and target in therapy or health promotion, for parents of zero- to three-year-olds to impose the greatest influence on language development. For example,



if a certain type of parent response such as *Expansions* (e.g., child says, *Ball*, parent responds, *It's a red ball*; Levickis et al., 2014, p. 277) was found to have a greater contribution to language acquisition than another type of parent response, then resources could be directed towards enhancing these specific behaviors in parents in order to improve child language outcomes. Knowing which specific types of responsive parent behaviors impact on language development would also add to the knowledge base that informs the development of language screening or assessment tools by identifying the most important risk or protective factors relating to parent behaviors. This type of future research would also aid in identifying further areas where there are research gaps or excesses across the construct of PR for child language outcomes.

The current systematic review identified research gaps, suggesting future primary research studies focus on investigating the effects of CR on language areas such as receptive and expressive syntax, pragmatics and phonological awareness as these areas of language development were less commonly investigated. A focus on conducting more experimental studies on the effects of CR on aspects of language broader than early vocalizations would help to consolidate and strengthen results found by descriptive, longitudinal studies and comparative cohort studies. Alternatively, a focus on conducting additional quality observational studies about parental CR in the first three years of childhood and language development would assist the generalizability of results.

Finally, this systematic review highlighted a need for improved quality in the reporting of statistical information, inclusion criteria, demographic information, and reasons for participant withdrawal, in order to allow for better interpretation and generalizability of results. Studies did not report statistical power calculations, which limits the ability to discern whether their sample sizes were sufficient to draw accurate statistical conclusions. Also, definitions and coding procedures used to identify and measure PR need to be clear and explicit, with examples provided. In this way, even if researchers use

different terminology to label responsive parent behaviors, they can still be grouped according to their definitions and descriptions for synthesis across studies. After all, one must rely on authors' clear and comprehensive definitions of the parent behaviors to understand what is being coded and what the data is based on. Ideally, further research developing an explicit, shared conceptual system for the PR construct would provide a platform for consistency in labeling and defining PR behaviors, which will ultimately make the research more accessible for translation into clinical practice.

## **Conclusions**

Meta-analyses provide evidence that parents' prompt, contingent and appropriate responses to children during naturalistic conditions in the first two and a half years of life: (a) are connected to the development of receptive vocabulary to a medium, statistically significant degree, and (b) have a large, statistically significant association to the status of expressive language being typical or delayed. Other findings indicate that parental CR to infants contributes to the development of the prelinguistic skills of attention and early vocalization. These findings have clinical relevance as to the focus of interventions or preventative measures. Conclusions about the association between CR and syntax, pragmatics and phonological awareness could not be made due to little or no information within the included studies. Future primary research on the relationship between CR and these language areas, as well as further systematic reviews about the relationship between other specific parent response types and children's language outcomes, would help to create a fuller picture of the relative influences of different responsive parenting behaviors. The methodology used for this systematic review provides a template for future systematic reviews that may involve other specified types of responsive parenting behaviors, and also demonstrates a solution to statistically combining conceptually similar language outcomes that are derived from a range of tools and ages.

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## Appendix A

### Search strategy for PubMed database

Language development	Parents	Infant	Responsiveness
Language[mh] OR Language development[mh] OR Language development disorders[mh] OR Verbal behavior[mh] OR Linguistics[mh:noexp] OR Nonverbal communication[mh:noexp] OR Comprehension[mh] OR Semantics[mh] OR Phonetics[mh] OR Speech perception[mh] OR Vocabulary[mh] OR child language[mh] or facial expression[mh] or gestures[mh] OR Mean length of utterance[tiab] OR MLU [tiab] OR Babbl*[tiab] OR Cooing[tiab] OR Preverbal[tiab] OR Pre-verbal[tiab] OR Prelinguistic[tiab] OR Pre-linguistic[tiab] OR Vocubular*[tiab] OR first word*[tiab] OR word product*[tiab] OR Talk*[tiab] OR Phonolog*[tiab] OR Morpholog*[tiab] OR Semantic*[tiab] OR Noun*[tiab] OR Morpheme*[tiab] OR Gesture*[tiab] OR Phonetic*[tiab] OR Nonverbal[tiab] OR Non-verbal[tiab] OR Facial expression*[tiab] OR Smil*[tiab] OR Comprehension[tiab] OR Vowel*[tiab] OR Gaze[tiab] OR Attention[tiab] OR Vocaliz*[tiab] OR Vocalis[tiab] OR Linguist*[tiab] OR Child development[tiab] OR language perception[tiab] OR language development[tiab] OR language delay*[tiab] OR language disorder*[tiab] OR language acquisition[tiab] OR Specific language impairment[tiab] OR SLI[tiab] OR Speech perception[tiab] OR Speech development[tiab] OR Speech delay*[tiab] OR Speech disorder*[tiab] OR Speech acquisition[tiab] OR Verbal behavior*[tiab] OR Verbal behaviour*[tiab] OR delayed speech[tiab] or delayed language[tiab] OR gazing[tiab]	parent-child relations[mh] OR child of impaired parents[mh] OR Parents[mh] OR Maternal behavior[mh] OR Paternal behavior[mh] OR Caregiver*[tiab] OR Caretaker*[tiab] OR mother*[tiab] OR father*[tiab] OR parent*[tiab] OR child of impaired parent*[tiab] OR maternal [tiab] OR paternal [tiab]	Infant[mh] OR Child, preschool[mh] OR Toddler*[tiab] OR Child*[tiab] OR Infan*[tiab] OR Baby[tiab] OR Babies[tiab] OR Preschool*[tiab]	Directiveness[tiab] OR responsiveness[tiab] OR input[tiab] OR sensitive[tiab] OR interaction[tiab] OR engagement[tiab] OR child-directed[tiab] OR infant-directed[tiab] OR maternal control[tiab] OR dyads[tiab] OR joint attention[tiab]

*Note.* Logic grids for other databases are available from the first author

## Appendix B

### Demographic Information for Included Studies

Study	Country	SES	Language/ethnicity/race	Mother education	Father education
Alston and James-Roberts (2005)	UK	Social class 1: Del = 26%, Typ = 20%; Social class 2: Del = 26%, Typ = 23%, Social class 3: Del = 26%, Typ = 23%	Caucasian (MoDel = 79%, MoTyp = 83%, FaDel = 74%, FaTyp = 77%. Remaining = African-Caribbean or Asian	University degree: Del = 42%, Typ = 50%	University degree: Del = 45%, Typ = 56% (No statistically significant difference reported).
Bornstein et al. (1990)	USA	Middle to upper <sup>b</sup>	-	Mean years post high school education = 6.5 (SD = 2.3)	-
Bornstein and Tamis-LeMonda (1997)	Japan	Broadly middle SES households	Japanese	High school, community school, junior college or university	-
Coates and Lewis (1984)	USA	95% middle or upper-middle <sup>a</sup>	33.3% African-American, 66.6% Caucasian	-	-
Goldstein and Schwade (2008)	USA	-	English	-	-
Hoffer and Bliss (1990)	USA	-	Caucasian, native English	Matched across groups (high school or college)	-
Masataka (1993)	Japan	-	Japanese	-	-
Paavola et al. (2005)	Finland	Middle to upper based on parent occupational status	Finnish	Mean years total schooling completed = 17 (SD = 3.7). 63% had tertiary education	-
Paul and Elwood (1991)	USA	On scale of 1-5 (1 = highest SES): Typ: $M = 2.6$ ( $SD = 1.4$ ); Del: $M = 2.8$ ( $SD = 1.0$ ) <sup>a</sup>	-	-	-
Tamis-LeMonda et al. (1998)	USA	Middle to upper-middle class <sup>b</sup> ( $M = 58.7$ , $SD = 6.3$ )	English	-	-
Tamis-LeMonda et al. (2004)	USA	All mothers were eligible for some form of governmental assistance; 75.2% received welfare, food stamps, Aid to Families With Dependent Children, or Medicaid. Over 90% of fathers employed part or full time	English speaking (Fa = 87%, Mo 89%); European-American, (Fa = 60%, Mo = 63.1%); African-American (Fa = 21.7%, Mo = 12.4%); Latino (Fa = 15.2%, Mo = 12.4%); Other (Fa = 3%, Mo = 4.4%).	Eleven or fewer years of high school: 25.9%; high school graduate: 35.9%; completed/graduated from college: 38.3%	Eleven or fewer years of high school: 36.2%; high school graduate: 27.2%; completed/graduated from college: 36.6%
Vigil et al. (2005)	Unclear whether UK or USA	-	English	80% high school or higher	-

Note. Typ = typically developing, Del = delayed language. Mo = mother, Fa = Father.

<sup>a</sup>Based on Myers and Bean's (1968) adaptation of the Hollingshead method. <sup>b</sup>Using Hollingshead Four Factor index of Social Status, 1975.

## Appendix C

### Conceptualization and Operationalization of CR in Included Studies

Study	Term/Definition/Description provided by authors	Method of measurement	Duration of observation <sup>a</sup>	Activity	Setting	Child age (months)
<i>Experimental Studies</i>						
Goldstein and Schwade (2008)	<b>Contingent response:</b> Mother responded “to each babbles by speaking while moving closer to, smiling at, and touching their infant” (p. 516). Mothers were instructed to provide <i>resonant</i> sounds or speaking words with <i>consonant-vowel</i> alternations.	F	10 min	WU+ N SST	LO	Mean = 9.5
Goldstein and Schwade (2008)	<b>Non-contingent (i.e., yoked control):</b> Mothers “responded using the same utterances as the contingent-condition mothers with whom they were paired. The timing [sic] was governed by the contingent-condition mothers” (p. 516).	F	10 min	WU+ N SST	LO	Mean = 9.5
Masataka (1993)	<b>Contingent response:</b> “Mother responded only after infant vocalization, thereby maintaining conversational turn-taking with child” (p. 305). E.g., Light touch, smile, saying ‘Hi (baby’s name)’ simultaneously.	F	2 min baseline 6 min test	Face-to-face position, maintained eye contact. Baby supine.	HO	3, 4
Masataka (1993)	<b>Random response:</b> Mothers interacted on a prearranged schedule and independently on the timing of child’s vocal utterances, resulting in violation of conversational turn taking (p. 305). E.g., Light touch, smile, saying ‘Hi (baby’s name)’ simultaneously.	F	As above	As above	HO	3, 4
<i>Comparative Cohort Studies</i>						
Alston and St James-Roberts (2005)	<b>Maternal sensitivity:</b> Mother was “appropriately attentive to infant as well as appropriately and contingently responsive to his/her affect, current level of arousal, interests and abilities...Pace and the level of interaction were contingent upon the infant’s actions and responses. Followed the infant’s signals and was tuned in to the infant. She showed awareness of infant’s moods, interests and capabilities, and allowed awareness of these to guide her interactions. She also provided contingent vocal stimulation and interaction was well timed and paced to the infant’s responses. Lack of sensitivity was observed in a pattern of maternal behavior characterized by ignoring or missing the infant’s bids for attention and appearing unaware of infant’s needs for appropriate interaction” (p. 128).	Authors’ coding system using definitions. Used 5-point rating scales ranging from 1 (low sensitivity) to 5 (high sensitivity). 75 min of time sampling method. 30s observe 30s take notes. S	75 min time sampling = 37.5 min observing	N	HO I	10
Hoffer and Bliss (1990)	<b>General maternal responsiveness score:</b> “The proportion of the total number of maternal speech acts she made that were coded responsive to a prior child utterance. This score reflects mothers’ responsive speech both to children’s spontaneous initiatives and to children’s responsive speech” (p. 310).	Authors’ coding using definitions	60 min	Cooking FP	HO	Stage-matched = 24,

Study	Term/Definition/Description provided by authors	Method of measurement	Duration of observation <sup>a</sup>	Activity	Setting	Child age (months)
		F		SST		Language-impaired = 45.6
Hoffer and Bliss (1990)	<b>Percentage ignored (child initiatives):</b> "A child's initiative was coded as ignored if the mother made no response to a direct request, a question, or an exclamation of distress/hurt. In addition, a second consecutive instance of a declarative comment that had not received a response was coded as ignored" (p. 310)	Authors' coding using definitions F	60 min	Cooking FP SST	HO	Stage-matched = 24, Language-impaired = 45.6
Paul and Elwood (2011)	<b>Pragmatic function/illocutionary intent: responses to child's bid for attention:</b> Remarks in which the mother responded verbally to a child's attempt to get her attention" (p. 985). E.g., Mother says, 'Yes?', 'Hmm?'	Authors' coding system using definitions. Maternal utterances analyzed in the context of the previous child utterance. Operationalized as a percentage of mother's utterances. F	10 min	WU+ FP	LO I	20-33
Vigil et al., (2005)	<b>Proportion of responses to child initiations:</b> "Parents are taught to follow a child's communicative lead. The parents are directed to wait for the child to initiate verbally as well as nonverbally, then the parents can respond to that initiation" (p. 113).	Authors' coding system using definitions. F	10 min	FP SST	LO	24-29 (mean = 25.7)
<i>Descriptive Studies</i>						
Bornstein et al., (1990)	<b>Contingent response to infant non-distress:</b> "Mothers were credited with responding contingently to infant nondistress if, within a 30s period, they behaved in a way which was contingent on infants' nondistress vocalisation or nondistress behavior" (p. 17). E.g., Looking, touching, moving object towards infant, naming object.	Authors' coding system. Alternating 30s observing and recording periods using automatic timer F	45 min	N Alert	HO	5
Bornstein and Tamis-LeMonda (1997) <sup>a</sup>	<b>Responsiveness to infant nondistress:</b> "Mothers responding promptly, contingently, and appropriately in either a physical or verbal manner within the same 30s coding interval to the infant nondistress (exploration or vocalisation) activities. Responsiveness met 3 criteria: (a) the infant acted or vocalized nondistress, (b) the mother displayed a change in her own activity subsequent to the infant's behavior within the 30s timeframe, and (c) the mother's response was infant dependent and appropriate (vs. intrusive or controlling) in the sense that it related conceptually to the infant's prior action" (p. 286). E.g., Infant looks at an object and mother then names it, describes it or moves it towards the infant so infant can reach.	Authors' coding system. At 5 months: 30s sampling intervals. Number of (30s) sampling intervals in which maternal responsiveness occurred. Calculated as the number of intervals in which a mother responded to her infant's nondistress activity divided by the number of intervals in which an infant acted in a nondistress fashion.	WU+ 45 min (5 month) 15 min (13 month)	N FP SST Alert	HO	5, 13

Study	Term/Definition/Description provided by authors	Method of measurement	Duration of observation <sup>a</sup>	Activity	Setting	Child age (months)
Coates and Lewis (1984)	<b>Vocal responsivity:</b> Vocalisation to the infant which was "observed to occur after the infant behavior within the 10s interval" (p. 1221).	F Authors' coding system using a checklist sheet. Checking off occurrence of mothers' (and infant) behaviors each 10s.	2 hr	N Alert Several visits if needed	HO	3
Paavola et al., (2005)	<b>Fillers:</b> "A maternal verbal response was defined as a meaningful change in the mother's verbal or vocal behavior which was contiguous and contingent on the child exhibiting a vocal or exploratory act...it had to occur within a 5s period following the child act" (p. 177). Fillers were defined as, "Words not conveying any referential meaning and appear to be used as automatic responses" (p. 195). E.g., Mother says, 'Uh oh' or 'Mm'.	F Author's coding system using definitions.	15 min	FP SST	HO	10
Tamis-LeMonda et al., (2004)	<b>Fathers' and Mothers' sensitivity:</b> "Parent takes the child's perspective, accurately perceives the child's signals, and promptly and appropriately responds to these signals" (p. 1810).	S Adapted scales (Clarke-Stewart, Vandell, Burchinal, O'Brien, & McCartney, 2002; NICHD Early Child Care Research ECCRN & Network, 1999). Used 7-pt scale ranging from 1 (very low) to 7 (very high).	10 min	FP SST (three bags of toys used in sequence)	HO	24, 36
Tamis-LeMonda et al., (1998)	<b>Maternal responses:</b> "Specifically, responsiveness was defined as a positive and meaningful change in mothers' verbal behavior subsequent to and dependent on a change in a child vocal or exploratory act within a 5sec period following the act" (p. 684). E.g., Child looks at bottle. Mother says, 'bottle', or child said 'bottle' to a bottle, and mother responded 'that's a bottle'.	S Used modified measure detailed in Baumwell et al. (1997). Summing the frequency of times a mother verbally responded to her toddler.	10 min	FP SST	HO	9, 13

*Note.* For Method of measurement: F = frequency count, S = scale (e.g., Likert scale). For Setting: HO = home observation, LO = laboratory or clinic observation, I = instruction such as "play as you would normally play at home" provided to parents; for Activity: N = naturalistic conditions including normal daily activities, WU+ = warm up period prior to observation or a previous visit to familiarize child, FP = free play (semistructured or structured), SST = standard set of age appropriate toys (such as farm set, kitchen set, animals, blocks, plastic food, dolls and doll house, vehicles and toy telephone), Alert = infant in alert state.

<sup>a</sup> When different amounts of time were used to observe parent-child interactions, the minimum amount was included in the descriptive statistics in the systematic review.

## Appendix D

### Methodological Quality of Included Studies

Table D1

Results of Critical Appraisal of Included Randomized Controlled Trials using JBI

#### MAStARI

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Masataka, 1993	N	U	N	N/A	Y	Y	Y	Y	Y	Y
Goldstein & Schwade, 2008	U	N/A	N	Y	Y	Y	Y	Y	Y	Y
% criterion achieved	0	0	0	50	100	100	100	100	100	100

*Note.* JBI MAStARI = Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument. Q1 = Was the assignment to treatment groups truly random? Q2 = Were participants blinded to treatment allocation? Q3 = Was allocation to treatment groups concealed from the allocator? Q4 = Were the outcomes of people who withdrew described and included in the analysis? Q5 = Were those assessing outcomes blind to the treatment allocation? Q6 = Were the control and treatment groups comparable at entry? Q7 = Were groups treated identically other than for the named interventions? Q8 = Were outcomes measured in the same way for all groups? Q9 = Were outcomes measured in a reliable way? Q10 = Was appropriate statistical analysis used? N = no, Y = yes, U = unclear, N/A = not applicable

Both experimental studies met six of the 10 quality criteria, which allowed for passing of critical appraisal. With question four being irrelevant for one study because there were no withdrawals, only questions one to three (about blinding and randomization) were not met by both studies. The study by Masataka (1993) stated that participants were randomized into their groups but did not provide details of the randomization methods used, therefore could not be credited with meeting that quality question. Goldstein & Schwade (2008) reported randomization into two experimental conditions, but did not report initial randomization of subjects into treatment versus control groups. Blinding of the allocator (quality question three) and participants (quality question two) were not reported. However the importance of question two is low because the infants involved in the experiment are inherently unaware of their allocation, and parents would have been required to know in order to perform the required schedule of behaviors towards their infants.



Table D2

Results of Critical Appraisal of Included Comparative Cohort Studies using JBI MAStARI

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Alston & James-Roberts, 2005	Y	Y	Y	Y	Y	Y	N	Y	Y
Hoffer & Bliss, 1990	U	Y	Y	Y	Y	Y	N/A	Y	Y
Paul & Elwood, 1991	U	Y	Y	Y	Y	N/A	N/A	Y	Y
Vigil, Hodges, & Klee, 2005	U	Y	Y	Y	Y	N/A	N/A	Y	Y
% criterion achieved	25	100	100	100	100	50	0	100	100

*Note.* JBI MAStARI = Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument. Q1 = Is the sample representative of patients in the population as a whole? Q2 = Are the patients at a similar point in the course of their condition/illness? Q3 = Has bias been minimized in relation to the selection of cases and of controls? Q4 = Are confounding factors identified and strategies to deal with them stated? Q5 = Are outcomes assessed using objective criteria? Q6 = Was follow up carried out over a sufficient time frame? Q7 = Were the outcomes of people who withdrew described and included in the analysis? Q8 = Were outcomes measured in a reliable way? Q9 = Was appropriate statistical analysis used? N = no, Y = yes, U = unclear, N/A = not applicable

All four comparative cohort studies achieved criteria for six of the nine quality questions, which were: (question one) participants being at a similar point in the course of their condition, (question three) minimizing bias for selection of cases and controls, (question four) identifying confounding factors and strategies to deal with them, (question five) using objective criteria to assess outcomes, (question eight) measuring outcomes in a reliable way, and (question nine) using appropriate statistical analysis. Quality question six, regarding follow up being carried out over a sufficient time period was met by two of the four studies, and was not relevant for two studies that assessed responsiveness and language concurrently. The quality area requiring most improvement was question one, regarding the sample being representative of participants in the population as a whole. All but one study did not provide clear information regarding the broader geographical and demographic context, and/or the participants in order to assess whether participants are representative of the broader population. Question seven, regarding whether outcomes of people who withdrew were described and included was not applicable for three studies and not reported for one.

Table D3

## Results of Critical Appraisal of Included Descriptive Studies Using JBI MASTARI

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Bornstein, Miyake, Azuma, & Tamis-LeMonda, 1990	N	U	Y	Y	Y	Y	N	Y	Y
Bornstein & Tamis-LeMonda, 1997	N	N	Y	Y	Y	Y	U	Y	Y
Coates & Lewis, 1984	N	U	Y	Y	Y	Y	N	Y	Y
Paavola, Kunnari, Moilanen, & Lehtihalmes, 2005	N	Y	Y	Y	Y	N/A	N/A	Y	Y
Tamis-Lemonda, Bornstein, Kahana-Kalman, Baumwell, & Cyphers, 1998	N	Y	Y	Y	Y	Y	N/A	Y	Y
Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004	U	Y	Y	Y	Y	Y	N	Y	Y
%	0	42.9	100	100	100	83.3	0	100	100

*Note.* JBI MASTARI = Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument. Q1 = Was the study based on random or pseudo-random sample? Q2 = Were the criteria for inclusion in the sample clearly defined? Q3 = Were confounding factors identified and strategies to deal with them stated? Q4 = Were outcomes assessed using objective criteria? Q5 = If comparisons are being made, were there sufficient descriptions of the groups? Q6 = Was follow up carried out over a sufficient time frame? Q7 = Were the outcomes of people who withdrew described and included in the analysis? Q8 = Were outcomes measured in a reliable way? Q9 = Was appropriate statistical analysis used? N = no, Y = yes, U = unclear, N/A = not applicable

All six of the descriptive studies met the criteria for five of the nine quality questions, which were (question three) identifying confounding factors and strategies to deal with them, (question four) using objective criteria to assess outcomes, (question five) providing sufficient descriptions of groups when comparisons are being made, (question eight) measuring outcomes in a reliable way, and (question nine) using appropriate statistical analysis. A further question regarding follow up being carried out over a sufficient time period was met at a high standard (question six; five studies achieved criterion). It was considered acceptable that question one, regarding randomization of the sample, was not met as this was not applicable given convenience sampling or self-selection via advertisements is often used for these kinds of observational studies. Areas of weakness were in clearly describing inclusion criteria (question two; 50% achieved), and providing outcomes for participants who withdrew, when applicable (question seven; 0% achieved).

## Acknowledgments

This research was undertaken during the primary author's tenure of the Australian Postgraduate Award research scholarship. Thanks go to Matthew Kowald (secondary reviewer) for contribution to the critical appraisal phase of systematic review, Maureen Bell (research librarian, The University of Adelaide) for assistance in developing search strategies, Dr Stuart Howell (statistician, The University of Adelaide) for support regarding statistical methodologies, and Dr Yee Mei Lee for assisting with the retrieval of many full text papers.

## Footnotes

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<sup>1</sup> Such as the Centre for Epidemiological Research Depression Scale (CES-D) (Sawyer Radloff, 1977). CES-D provides an assessment of symptoms but is not a clinical diagnostic tool of depression (Roberts, R., personal communication, University of Adelaide, School of Psychology, October 2012).

<sup>2</sup> Brown's language ages are defined by children's mean length of utterance in morphemes (MLUm). Children up to the end of Brown's stage II were included. Based on child development norms and descriptions of Brown's stages, this equates to 36 months old, with a MLUm of 2.25 (range 2.0 - 2.5; Bowen, 2013; Brown, 1973). Late-talking or language-delayed children older than 3;0 were included if their MLUm was below 2.5.

<sup>3</sup> The initial search terms were obtained from index terms and text words contained in the titles and abstracts from a selection of frequently cited papers.

<sup>4</sup> For more information about the use of effect sizes based on correlations see Borenstein, Hedges, Higgins, and Rothstein (2009) and Field and Gillett (2010).

<sup>5</sup> For example, correlations have been found between the MacArthur Communicative Development Inventory – Short Form and Peabody Picture Vocabulary Test (PPVT; Pan, Rowe, Spier, & Tamis-LeMonda, 2004) and the Wechsler Intelligence Scale for Children - Revised verbal achievement construct and PPVT (Booney Vance, Blixt, & Singer, 1981; D'amato, Gray, & Dean, 1988).

<sup>6</sup> The difference between child and parent numbers is due to both mothers and fathers being independently observed with their children in one study (Tamis-LeMonda et al., 2004).

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<sup>7</sup> Reliability of coding was a required criterion to pass critical appraisal in order to be included in the systematic review.

<sup>8</sup> Based on the age of occurrence of language assessments within  $n = 12$  studies. For studies that assessed more than one area of language at one age-point, the age was counted only once (e.g., expressive vocabulary and pragmatics both assessed at 12 months old in one study: counted once for this age). For studies that provided a language outcome for more than one age, each age was counted (e.g., number of vocalizations at 3 months old *and* number of vocalizations at four months old: both three and four months are counted). For studies that reported outcomes in terms of age of attainment of milestones, each mean age for each milestone was counted (e.g., in Tamis LeMonda et al., [1998] mean age for first words in production is 12.8 months which was coded into the category of 8-15 months). Subsequently, percentages are based on  $n = 17$  events of assessment for the 12 included studies.

<sup>9</sup> Visual attention was operationalized as a frequency count for the number of 30-s intervals in which looks to mother occurred during the observation period, based on a minimum of 45 events of 30-s observations (i.e., minimum 22.5 minutes observation).

<sup>10</sup> In this study, attention was operationalized as the mean duration of the two longest episodes of uninterrupted attention to toys.

<sup>11</sup> Authors labeled these sounds as *syllabic*, which were characterized by greater oral resonance, pitch and resemblance to real talking compared to *vocalic* sounds that were less speech-like, uniform in pitch and produced mostly at the back of the mouth with greater nasal resonance.

<sup>12</sup> Data from Tamis-LeMonda et al. (2004) were analyzed both in meta-analysis and narrative synthesis due to the nature of the data (described further in main text). Coates and Lewis (1984) was another study included in the meta-analysis that also reported additional data (at a second time-point; PPVT at 2;0) but its statistical relation to CR was not provided therefore could not be analyzed further.

<sup>13</sup> The conventions formulated by Cohen (1988) were used for interpreting the effect sizes expressed as correlation coefficients. Effect sizes around  $r = .10$  were considered as small, effect sizes around  $r = .25$  as medium, and effect sizes around  $r = .40$  as large.

<sup>14</sup> The outlier effect is possibly due to a difference in the qualitative nature of the parent's CR. This issue will be explored further in the discussion section of this paper.

<sup>15</sup> Measured through parent report.

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<sup>16</sup> Although valid and relevant, these correlations could not be used in the meta-analysis because vocabulary outcomes were reported as the age at which children reached language milestones as opposed to a test score.

<sup>17</sup> This additional correlation data could not be included in meta-analysis as it involved CR data from more than one time-point (24 and 36 months), and observations with fathers. For statistical rigor, only the (predictive) correlation between mothers' CR (which the authors term *Sensitivity*) at the first time point (24 months) with PPVT scores at 36 months ( $r = .38, p < .001$ ) was included in the meta-analysis.

<sup>18</sup> See Tamis-LeMonda et al., 1998 for more detailed description of the statistical approaches used. Predictors were mothers' responsiveness at 0;9 and 1;1, and the mean age for achievement of child language milestones: first imitation, first words in production, and 50 words comprehension. This systematic review focuses on the results pertaining to parent input (i.e., CR at 0;9 and 1;1).

<sup>19</sup> See Tamis-LeMonda et al., 1998 for more detailed description of the statistical approaches used. Predictors were mothers' responsiveness at nine and 1;1, and the mean age for achievement of child language milestones: first imitation, first words in production, and 50 words comprehension. The systematic review focuses on the results pertaining to parent input.

<sup>20</sup> SMD of .2 is considered small; .5 is considered moderate; and 0.8 is considered large (Cohen, 1988).

## **Chapter 5: Discussion**

### **The Association between Children's Language Outcomes and CR.**

This thesis set out to examine the associations between CR – the degree or frequency of parent response that is prompt, appropriate and dependent (i.e., contingent) upon a child's prior behaviour – with children's language outcomes (e.g., infant attention and vocalisation; comprehension and production of words and phrases). The use of systematic review methodology, including implementation of a conceptual framework to establish conceptual heterogeneity prior to data synthesis, strengthens the research message. Findings from the systematic review affirm associations between parental CR and a range of pre-linguistic and linguistic skills, suggesting that: (a) parental CR to infants as young as three months old, contributes towards attention and early vocalisation abilities – skills that independently influence later language outcomes (Walker & Bass-Ringdahl, 2008); children's receptive vocabulary development is influenced by parental CR by up to 10% of the total variance (Meta-analysis 1:  $r = .22$ ,  $p = .001$ ,  $N = 245$  child-mother dyads;  $r = .31$ ,  $p < .01$ ,  $N = 218$  dyads, when one outlier study was removed); and the status of children's typical or delayed expressive vocabulary is related to parental CR to a large, statistically significant degree (Meta-analysis 2:  $SMD = .81$ ,  $p = .01$ ). By confirming an association between children's language development and parental CR, the systematic review results support the practice of parent-focused interventions that aim to increase levels of parental CR towards children aged zero to three years, in order to facilitate children's language development. This information can be used to inform policy, public health messages, and clinical practices relating to early parent-child interactions for children's optimal language development (Chapter Four).

### **The Value of PRD Conceptual Homogeneity**

Parental responsiveness and directiveness, as it relates to children's language development, is a complex and rich topic that has been researched empirically by many different people, from different disciplines, over decades. While this creates a rich research base, it also makes the interpretation, comparison and synthesis of findings difficult due to the heterogeneity in PRD terminology, definitions and measurement across the primary research. Even though associations between children's language development and aspects of PRD have been previously demonstrated in the empirical

research, the conceptual diversity has made it difficult to know whether studies are referring to the same or different parent behaviours, which undermines confidence in the findings. The present research provides increased confidence that the associations found in the systematic review relates to a homogenous grouping of parent behaviours from the complex parenting construct, because the empirical data was derived from studies that conceptualise PRD in the same way. This was achieved via the development and implementation of a conceptual framework.

Although this thesis originally set out to investigate the association between children's language outcomes and *PRD* as a *global* concept, the focus was then narrowed to *CR*. This is because the systematic review protocol encapsulated PRD as a global term without taking the richness of the construct into account – the heterogeneity of PRD excluded meaningful synthesis (either statistically or narratively). Conceptual heterogeneity was revealed to such a point during the implementation phases of the systematic review, that it required a PRD conceptual framework to be developed and applied. By delineating the different aspects of PRD via the developed conceptual framework, conceptual clarity and homogeneity for data synthesis were achieved. Consequently, the systematic review in this thesis affirms the association between parental CR and children's language development with greater confidence that results truly reflect the effects of *this* aspect of PRD, due to the methodological steps taken. Furthermore, this thesis contributes to conceptual clarity for the construct of PRD through the conceptual framework, and also demonstrates the value of an iterative process for modifying systematic review research protocols in the context of complex social constructs.

## **Implications for Policy, Practice and Research**

### **Children's language and contingent responsiveness.**

The systematic review findings support public health approaches that target parents of 0- to 3-year-olds to improve child development outcomes – including language development – given an association between parental CR and language outcomes was confirmed for this population. The Sure Start Local Programs (SSLPs) is an example of such a targeted public health initiative in which programming is “oriented to improving interactions between parents and their children” (Myers, Barnes, & Kapoor, p. 4). The SSLPs Speech and Language Synthesis Report notes that an important factor in assisting children's language development is “in encouraging parents and carers to [sic]

respond to their attempts to communicate” (Myers, Barnes, & Kapoor, p. 9), which ultimately, is about parents being contingently responsive. The delivery of key messages, tailored to the community needs would be an important aspect of this type of service provision, such as messages about the parent/carer role in facilitating children’s language development. As well as supporting the targeted public health model more broadly, the systematic review findings could guide public health messages regarding parent-child interactions for optimal child development. However, more empirical studies examining CR in the 0-3 age range and language outcomes are needed to strengthen the generalisability of the results for a population approach.

The systematic review results could also help to inform research that is seeking to improve the early identification of persistent language delay by identifying the presence of other risk factors, in combination with language screening (e.g., see discussion in Down, et al. 2014). Prediction of persistent language delay solely from language screening in toddlerhood is not recommended (Reilly, McKean, Morgan & Wake, 2015), and “little is known about the selection of risk factors for language delay” (Wake et al., 2011. p 4). Therefore, the positive medium and large associations between CR and children’s receptive and expressive vocabularies respectively, as shown by the meta-analyses, suggest CR could be considered one of the risk (or protective) factors for lasting language delay. As previously mentioned, one can be confident that the association truly reflects parental CR (as opposed to a different aspect of PRD) because the synthesised results come from conceptually aligned studies.

### **Understanding the MRD/PRD<sup>3</sup> construct.**

The variation in PRD terminology and definitions found across the extant literature highlighted the value of a tool to facilitate increased consistency and comparability of terms, in order to make the research easier to understand and apply in practice or policy areas. Conceptual frameworks provide understanding by incorporating key sources of existing theories and research into a structure that is created, or constructed through a process of qualitative analysis (Jabareen, 2009; Maxwell, 2005), and offer “a shared language for researchers to clarify, design, undertake and conclude their research” (Leshem & Trafford, 2007, p. 100). The MRD conceptual framework described in Chapter Three appears to be the first of its kind, in that it was formed using a specified Conceptual Framework Analysis process (Jabareen, 2009), based on grounded theory

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<sup>3</sup> Please refer to thesis discussion section ‘Limitations and Considerations’ for an explanation why the terms PRD or MRD are used in this section.



methodology. Hence, the developed conceptual framework offers a credible new perspective to understanding this complex construct, having been informed by existing theories and terms and definitions from the literature.

Notably, the conceptual framework was labelled as *maternal (MRD)* as it was based largely from descriptions of *mother-child* interactions. The MRD conceptual framework now provides an easy visual representation of the different aspects of MRD for consideration – with MRD being organised into one superordinate category, *Contingent Responsiveness*, and three subordinate categories; *Emotional Support*, *Language Input*, and *Focus of Attention*, which are all further subcategorised. This information is useful because it provides a way to understand and categorise MRD behaviours found in research, observed in practice, and targeted for intervention.

In research, the conceptual framework could be used as a reference tool to increase the consistency of MRD/PRD terms and definitions across studies. A more standardised approach to labelling and defining MRD/PRD in studies would assist the understanding and interpretation of research findings because one can more easily discern whether studies are reporting on the same or different aspects of parent behaviours. The conceptual framework can also be used to understand and differentiate global assessments of maternal responsiveness (e.g., 5-point rating scale of from very low to very high levels of responsiveness, e.g., Down et al., 2014) by identifying which types of MRD/PRD behaviours are included (or not) in those coding systems, in relation to those described in the conceptual framework. For example, the conceptual framework would indicate that the definition for a ‘very high’ maternal responsiveness rating – “Mother frequently responds in a developmentally appropriate way either verbally or non-verbally to Child’s gestures or verbalizations AND Mother does not attempt to redirect Child’s focus from the current activity, but follows Child’s interests” (Down et al., 2014, p. 3) – involves the categories of *Contingent Responsiveness* (i.e., the frequency of appropriate maternal behaviours) and *Focus of Attention* (i.e., attempts to redirect or maintain the child’s attention). What the framework also offers is the identification of what *is not* included in their rating of maternal responsiveness, such as Emotional Support. The conceptual framework can be similarly applied as a reference tool to other global rating scales, thus enabling comparison of rating scales regarding the elements of MRD they contain, and the research data that is based on them. This example highlights how the challenge of interpreting the various PRD definitions and

measurement tools can be improved, if not mitigated, by the conceptual framework, which facilitates interpretation and application of the research knowledge.

Once validated, the conceptual framework could also be used to assist the development of a clinical practice framework, such as a standardised lexicon, for recording the presence or absence of MRD/PRD behaviours. This would assist the transferability of information between clinicians by providing consistent language to describe parent behaviours – rather than clinicians within or across disciplines using their own classification systems – so that information does not get lost in translation. In other words, clinicians can assign a *consistent* name to the types of parent behaviours they are observing or addressing in intervention.

### **Considerations for research methodology.**

This research has demonstrated the value of a flexible approach to implementing systematic review protocols, provided they are modified for justified reasons, and are reported transparently (Chapter Two). In the case of the systematic review within this thesis, the resultant MRD conceptual framework and narrower, more meaningful systematic review demonstrate the value of the protocol adjustments made. This is useful information for others who choose to undertake systematic reviews involving complex constructs, because they can either: (a) be forewarned about the potential issue of conceptual heterogeneity and the need for a coding system to organise data, and thus plan for this at protocol stage, or (b) be guided in their process of modifying the protocol due to unexpected findings, through a peer-reviewed (once Chapter Two is published) case example.

This research also demonstrated a novel approach to the meta-analysis of child language outcome data that were obtained from different tools, at different ages or for different aspects of language development (Chapter Four). Common metrics were used to enable synthesis of data – Pearson’s correlation coefficient for observational studies and standard mean difference for comparative cohort studies. A similar approach can be adopted in other systematic reviews that wish to synthesise outcomes that are the same in nature, but are using different tools across studies. This approach is particularly relevant for systematic reviews examining the association between aspects of PRD and language development.

Finally, the process by which the MRD conceptual framework was developed (Chapter Three) provides a successful example of applying Jabareen’s (2009)

Conceptual Framework Analysis technique. This is useful because it shows that his method can be successfully applied to achieve the desired outcome of a conceptual framework for a complex social construct, thereby validating his method.

### **Considerations for reporting standards.**

As part of the systematic review process, the critical appraisal of studies (which investigated children's language outcomes in the context of PRD) identified a number of areas that research reporting could be improved. Researchers in this field are encouraged to clearly report the statistical methods used (including power calculations), inclusion criteria, demographic information, setting information (e.g., laboratory/home, naturalistic/structured or unstructured play) and reasons for participant withdrawal in order to allow for better interpretation and generalizability of results.

It is also suggested that definitions and coding procedures used to identify and measure PRD in future research, are clear and explicit, with examples and original sources provided. For example, Levickis, Reilly, Girolametto, Ukoumunne and Wake (2014) provide an easy to understand table of their coding scheme containing all these elements. It may also be useful to specify the context as to what the parent behaviours are in response to; for example, reading books, children's play or language (e.g., Barachetti & Lavelli, 2011 and Tamis-LeMonda et al., 1996) so studies can be better interpreted and replicated. The clarity and consistency of PRD terminology, definition and measurement enables the reader to discern the type of behaviour being investigated, allowing for easier interpretation of the research for translation into clinical practice or policy. The MRD conceptual framework presented in this thesis could now be used as a reference tool to increase the consistency of labelling and defining MRD behaviours, or to interpret or categorise the MRD labels and definitions used in past research (see thesis discussion section, 'Understanding the MRD/PRD construct').

## **Future Directions**

### **Language development and parental responsiveness.**

The current work from Chapter Four could be extended by conducting a series of systematic reviews pertaining to each of the responsiveness categories and subcategories identified in Chapter Three (e.g. Language Input [Imitation, Labelling/Describing, Questions etc...]; Focus of attention [maintaining, redirecting etc...]). Even though Contingency (in conjunction with promptness and appropriateness)

is considered a core characteristic of responsive parenting, its measurement in research examines parenting from a broader perspective in contrast to looking at more fine-grained elements. Therefore, by conducting a series of systematic reviews investigating each responsiveness category and subcategory in relation to children's language outcomes, results may show that certain aspects of PRD are more critical than others for affecting children's language development. This would give a complete picture of how each PRD category identified by the conceptual framework, is associated with language development.

As outlined in Chapter Four, this type of research knowledge is clinically relevant as it could guide which parent behaviours to prioritise and target for intervention or health promotion, for parents of 0- to 3-year-olds, in order to impart the greatest influence on language development. For example, if a certain type of parent response such as Expansions (e.g., child says, *Ball*, parent responds, *It's a red ball*; Levickis et al., 2014, p. 277) was found to have a greater contribution to language acquisition than another type of parent response, then resources could be directed towards enhancing these specific behaviours in parents in order to improve child language outcomes. Knowing which types of PRD behaviours impact on language development could also add to the knowledge base that informs the development of language screening or assessment tools, by identifying the most important risk or protective factors relating to parent behaviours.

### **The conceptual framework.**

Maximising validity and reliability are critical research aims because they allow for replication of research trends and appropriate clinical decision-making (Mason & Bramble, 1989). Thus, further validating the conceptual framework would strengthen its credibility. Validity seeks to ensure that the conceptual framework truly represents what it purports to represent, in this case, the construct of MRD. In line with Jabareen's Conceptual Framework Analysis technique (Jabareen, 2009) validation can be achieved by checking whether the conceptual framework makes sense to other scholars or practitioners in the field through presenting, discussing and receiving feedback. So far, the framework has been derived from analysis of a comprehensive literature base and has been informally presented to professionals in the disciplines of Speech Pathology, Translational Health and Nursing/Midwifery. Reliability refers to the consistency of coding parent behaviours into categories of the conceptual framework by the same rater on two separate occasions (intra-rater reliability) or across different raters (inter-rater

reliability). Intra- and inter-rater reliability checks could be performed on the dataset (or subset) of MRD terms/definitions, to determine whether a person familiar with the topic is able to consistently categorise MRD behaviours into the current arrangement of categories in the conceptual framework (intra), and quantify the degree of agreement between two or more coders who independently code a dataset (or subset) of MRD terms/definitions into the framework categories.

## **Limitations and Considerations**

The systematic review results in this thesis are based on the synthesis of (predominantly) observational data, therefore, they infer association between CR and language outcomes, as opposed to causality. When RCTs are not possible, techniques such as propensity scores or directed acyclic graphs (DAGs) could be a potential way forward from association to causality as they offer a way of matching groups and increasing the power of the observational data (Austin, 2011; Foraita, Spallek & Zeeb, 2014). Alternatively, more RCT design studies on this topic would also provide information about causality; existing RCTs did not meet the criteria for inclusion into the systematic review (e.g., Landry et al, 2008; Appendix F).

As outlined in Chapters Three and Four, the results of the systematic review and conceptual framework are reflective of the Organisation for Economic Co-operation and Development (OECD) western countries which means that one would have to be careful about generalising results to other countries outside of the OECD. It seems that there is some capacity to generalise results from the systematic review's first meta-analysis to countries that are not English-speaking, as Japanese- and Finnish-speaking populations were involved in two of the included studies. However, additional studies would be required to confirm if the systematic review results are truly generalisable, and to extend the framework across culture and language.

Another consideration is that narrowing the definition for the phenomenon of interest in the systematic review to include only CR (as opposed to several types of MRD behaviours) had advantages and disadvantages – it enabled pooling of statistical data due to a homogenous data set, and also narrowed the review to the exclusion of many other studies examining other aspects of MRD (e.g. Warmth and/or positive affect, Redirecting attention). Ideally, including all types of MRD, with sub groupings for data synthesis, would have provided a fuller picture of the associations with children's language. However, it was beyond the scope of the Masters degree.

Another consideration relates to the similarities and differences between mothers and fathers, and the choice to refer to mothers' and fathers' responsive and directive behaviours as 'parental' (PRD) in the body of the thesis, and the systematic review, but use 'maternal' (MRD) for the conceptual framework. While it is recognised that mothers and fathers differ in their levels and styles of interactive involvement with infants and children (Berman & Pedersen, 1987; Lamb & Lewis, 2013), and the majority of the literature, in the 'examination of full text' phase of the systematic review involved mother-child dyads in their studies, some literature *did* involve fathers. Sixteen percent of the total number of parents from studies included in the systematic review were fathers ( $N = 111$ ). Hence, the term 'parental' was used in the systematic review, to acknowledge that fact, and facilitate a shift in thinking about the inclusion and importance of fathers. However, it should be noted that this variable was removed for Meta-analysis 1, thus the results from the meta-analysis reflect only mothers. Conversely, the vast majority of terms and definitions used to inform the conceptual framework were based on mother-child observations, hence the framework was labelled 'maternal'. Essentially, the presence of mothers alone, or with fathers in the synthesised literature informed the terminology used throughout the thesis.

## Concluding Remarks

This thesis aimed to synthesis the current evidence regarding the association between parental CR and a variety of children's language outcomes in order to more confidently inform related policy and practices. Results from this systematic review, although limited by sample size, and to observational data, indicated that parental CR towards children in the first two years of life is moderately and largely related to children's receptive and expressive vocabulary, respectively, and also contributes towards infant attention and early vocalisation skills. Additional studies examining the associations between contingent responsiveness and language outcomes are needed to improve the generalisability of results.

In undertaking the systematic review, this research demonstrated that a flexible approach to modifying systematic review protocols is acceptable – and in fact, useful for complex constructs – provided they are justified and transparent. Parental responsiveness and directiveness *is* a complex construct, reflected by the variation of terms, definitions, and measurement, in the literature. In response to this, the newly developed MRD conceptual framework offers a tool to assist conceptual clarity in order to improve assessment and interpretation of research and clinical findings.

## Appendix A: Original Systematic Review Protocol

Saliba, M. (2011). The relationship between parents' responsiveness to their infant's early communication and its subsequent growth, within the current societal context: a comprehensive systematic review (protocol). *JBI Library of Systematic Reviews and Implementation Reports*, 9(64 suppl), S97-S107.

### Review title

The relationship between parents' responsiveness to their infant's early communication and its subsequent growth, within the current societal context: A comprehensive systematic review

### Reviewers

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### Background

The importance and protective nature of children's early communication capacities, from birth to preschool years, in relation to later academic and social functioning is well established in the literature. Studies have shown links between early language competence (from birth to preschool) and later language, literacy, behavioural and social outcomes<sup>1-3</sup> as well as language, literacy and numeracy being shown to serve as key protective factors for positive life outcomes.<sup>4</sup> The term 'communication' includes speech (the physical production of sounds), language (understanding and expression of spoken and written language, from sounds to words to sentences, to discourse), pragmatics (the social use of language in interactions), fluency (the smooth rhythm and pattern of talking) and voice (the production of sound through the vocal cords).<sup>5,6</sup>

Prelinguistic and early language development are the areas of communication that are of primary interest in this systematic review because they are the predominant aspects of communication that studies measure, when investigating the impact of parent responsiveness on children's communication development. Prelinguistic communication skills are the foundation skills that facilitate infants' communication competence.<sup>7-10</sup> The prelinguistic period is typically from 0-12 months and skills include early vocal behaviours such as cooing and babbling,<sup>5</sup> symbolic and functional play,<sup>(cited in 7)</sup> attention,<sup>11, 12</sup> gestures such as facial expression,<sup>13</sup> eye contact, turn taking, copying<sup>9</sup> and phonetic (speech) perception.<sup>10</sup> Language development encompasses the sub-components of sound and sound patterns (phonological development), words (lexical development), sentences and grammar (syntactic and morphological development) and the development of communicative competence, incorporating pragmatic skills (language use in a social context).<sup>5</sup>

Communication development starts from the prelinguistic period and is influenced by environmental factors including parental (particularly maternal) responsiveness and directiveness. Responsiveness refers to adults' 'prompt, contingent, and appropriate' <sup>(cited in 14 pp64)</sup> responses to a child's behaviours. This definition underpins the various aspects or descriptions of responsiveness that have been researched in relation to children's communicative development, for example: maternal encouragement,<sup>15</sup> supportive parenting,<sup>16</sup> interpersonal timing,<sup>17</sup> and maternal behavioural and verbal responsiveness.<sup>14</sup> Masur and colleagues<sup>14</sup> also discuss the importance of considering *directiveness* (as well as responsiveness) when investigating the impact of parent speech and behaviour on children's communication development.



Directiveness is described as being 'characterised by attempts to command and control children's behaviour or attention' <sup>14(pp64)</sup> and may be supportive or intrusive in nature.

Research has shown predictive relationships between parental responsiveness and directiveness and children's language development.<sup>14,16,18,19</sup> Enhancing parent responsiveness to children's early communication can have positive effects on child development, social development, self esteem, the attachment relationship between parent and child literacy outcomes.<sup>20-23</sup> Hence, parents, as the primary caregivers, are in a powerful position to influence their child's communication development, and subsequent academic and social success, through the way they respond to their children from birth.

### The importance of this systematic review

This systematic review aims to support and direct evidenced based practice and health promotion in speech pathology and related fields that work with parents and infants or children. To the reviewer's awareness, no systematic reviews on the relationship between parent responsiveness and children's communication development have been developed to date.

Systematic reviews can play a role in the education of health professionals and lay people.<sup>24</sup> A systematic review on the relationship between parental responsiveness and children's communication development could support health professionals and policy makers in easily accessing synthesised information on this topic. Prevalence data on speech-language difficulties in 2 to 4 ½ year olds has been reported as 5-8%.<sup>(cited in 25 & 26)</sup> Whilst this percentage is not categorized into causal factors, it is plausible, based on the research on parental responsiveness, that a proportion of these children have speech-language difficulties due to a reduced level of parental responsiveness in their early learning environment. Despite the established evidence regarding the importance of maternal responsiveness on children's early communication development, which in turn, influences later life outcomes, it is the reviewer's opinion that this information is not widely promoted in the general community to serve as a preventative measure.

Using Gordon's operational classification of disease prevention, a universal or selective preventative measure would include public education as 'an essential aspect of the strategy for optimal public health practice'.<sup>27 (pp108)</sup> According to Gordon a universal preventative measure is desirable for everybody in the general population (i.e. all parents of infants or expectant parents), while a selective preventative measure is aimed at subgroups of the population who are considered to have characteristics that place them 'at risk' (i.e. parents who are at risk of being less responsive to their infants). This systematic review could encourage the focus of universal or selective health promotion and policy development on educating society about the benefits and importance of parent responsiveness in relation to child development outcomes. Health promotion and early parent education on the parent's role in children's early communication development could potentially reduce the number of preschool and school-age children with speech-language difficulties, hence reducing the economic, social and individual costs of this issue.

This comprehensive systematic review will incorporate both quantitative and textual components. A preliminary search of the literature has found that studies on parental responsiveness and children's communication development are quantitative by nature. The textual component of this review will set the context of current thinking and action in society in relation to the quantitative component. The textual component is important because it will investigate whether the research is being put into action, or at least has a profile in society. The textual component may help to clarify the direction, if any that government needs to take regarding public education on this topic. A qualitative component of this systematic review is not included because a preliminary search did not identify any qualitative papers, and a qualitative approach is not required to answer the research question presented.

## **Review question/objective**

The quantitative objective of this review is to determine the best available evidence on the relationship between parents' responsiveness to children's prelinguistic and early communication and their subsequent communication development.

More specifically, the questions are:

1. What are the attributes of parental responsiveness? That is: To delimit the attributes of parents' verbal and behavioural responsiveness and directiveness that influences children's preverbal and early communicative development.
2. Do some attributes of parent responsiveness have more consequence to children's early communication development than others?

3. Is the amount or frequency of parent responsiveness important? That is: Do varying levels of parent responsiveness impact differently on children's communication development?
4. Are there parental factors (e.g. education level) within the well population that predict or influence responsiveness quality and quantity? If so, what are they?

The textual objective is to identify the current social context within Australia, regarding the topic of parental responsiveness and children's communication development. More specifically, the questions are:

1. Does current government policy on child development reflect the research evidence identified in the quantitative component of this systematic review?
2. What is society's current awareness and standing (perception) on this topic, as identified through policy, expert and public opinion?
3. Are there preventative *universal* or *selective* health promotion measures in place relating to the review question?
4. If the answer to question 3 is 'yes', then what are they?

## Inclusion criteria

### Types of participants

The quantitative component of this review will consider studies that include parents as the primary independent variable and children as the secondary, dependent variable. More specifically, the review will include studies with:

#### 1. Parents

Because a main goal of this review is to support public education for universal or selective health promotion, parents who are identified as falling within the *well* or *at risk*, but not *clinically significant population* will be included. *Well* parents refer to the general public who are not affected by current suffering.<sup>27</sup> *At risk* parents may include parents whose social circumstances place them at risk of being less responsive to their children. For example, parents of low education or intellectual capacity, or of certain age. *At risk* parents will be included in this review because they have characteristics that place them in a position for selective preventive health promotion<sup>27</sup> and could provide insight into the outcomes of varying levels of parent responsiveness to children.

The term *clinically significant* refers to parents who have clinical diagnoses that impact on their capacity to respond to their children. For example, hearing impairment, and mental illnesses such as psychoses, schizophrenia, clinical or post-natal depression. These parents are excluded from the review because they present compounding factors that are beyond the scope of this review.

#### 2. Children

Children who's language level is preverbal (i.e. prelinguistic period) up to production of early phrases (E.g.: two-word utterances) will be included in this systematic review. Based on child development norms, these ages would typically include 0 - 3 year olds, however, studies that have older cohorts will also be included, providing the earlier years are also represented within the study.

Children who are typically developing, or defined as a 'late talker' or as having a specific speech/language issue will be included in this systematic review because these studies may reveal important information about parent responsiveness as a causal or influencing factor. Studies may or may not have control groups. Studies will not be considered for this review when children are identified as having any primary co-morbid condition such as syndromes, global developmental delays or disorders, Autism Spectrum Disorder, or hearing issue including hearing impairment and cochlear implant because this introduces too many confounding factors. Studies on bilingual children will not be included for the same reason.

Consideration will be made as whether to include children who spend care time with a carer other than their primary parent/caregiver, for example, childcare. The amount of time spent in the care of persons/institutions other than their parents is important to consider because the review is examining the relationship between the parent's impact on the child through their responsiveness attributes and levels. It is beyond the scope of the review to consider the language development of children independent of their parent's responsiveness. The reviewer will examine the literature to determine the cut off point for time spent in childcare. Where this is not clear, the reviewer will contact the authors of the studies for this specific information.

The textual component of this review will consider discourse and opinion reported or published by government agencies, experts, the public and media, about the systematic review question, that is of direct relevance or interest to Australia.

#### **Types of intervention(s)**

The quantitative component of the review will consider any studies that evaluate parent verbal and behavioural responsiveness and directiveness to their children's preverbal and or early linguistic communication. Studies may investigate parent responsiveness and or directiveness in the context of a home or clinical/education environment. The reviewer will take the environment (e.g. home, laboratory, community settings) in which studies gather their data into consideration throughout the review process.

The textual component of this review will consider published and unpublished papers that describe society's and government's current attitudes and opinions regarding the topic of parental responsiveness to infant and early communication.

#### **Types of outcomes**

The quantitative component of this review will consider studies that include outcome measures of child prelinguistic and early language development. This includes, but is not limited to, measures of language milestones such as comprehension of first words, speech sound perception, babbling, first word production, first 50 words and first 2-word utterance. The process of the systematic review may reveal other important prelinguistic or early language outcomes, which may be considered for inclusion depending on the validity, reliability and standardisation of the tools used to obtain the data. The preferred type of assessment tools used to retrieve data about child language outcomes will be standardised language/communication assessments. However, parent reports and non-standardised assessments will also be considered for inclusion.

The textual component of this review will consider discourse and opinion about the topic of parental responsiveness and children's communication development, as reported in textual or policy papers. The outcome will be the main themes and concepts identified through expert and society opinions, and government policy, in relation to the review question.

#### **Types of studies**

The quantitative component of the review will consider analytical epidemiological study designs including prospective and retrospective cohort studies, case control studies and analytical cross sectional studies for inclusion. Randomised control trials of parent responsiveness are not ethically possible, therefore will not be included in this review. Case series studies have not been identified in preliminary search of the topic, therefore will not be included in this review.

The textual component will consider expert opinion, discussion papers, position papers, government policies and reports, conference papers, theses and dissertations, and other text relating to child development/health promotion/early education within the context and parameters of the review question. Discourse must be written in English and be of western culture. Discourse from Australia is of primary interest. Discourse from other countries that constitute western society (i.e.: the Americas, New Zealand and Western Europe)<sup>28</sup> will only be included where it has been shown to be of interest to Australia. For example, an Australian expert has commented on a paper from another Western country.

### **Search strategy**

The search strategy aims to find both published and unpublished studies. A three-step search strategy will be utilised for each component of this review. An initial limited search of PubMed and CINAHL will be undertaken followed by analysis of the text words contained in the title and abstract, and of the index terms used to describe article. A second search using all identified keywords and index terms will then be undertaken across all included databases. Where necessary, terms and indexing language will be adjusted to search the other databases listed. This process will be done in close consultation with the Research Librarian for Mental Health, Psychiatry, Psychology, University of Adelaide. Thirdly, the reference list of all identified reports and articles will be searched for additional studies. Studies published in English will be considered for inclusion in this review. As there are no other identified systematic reviews on this topic, any quantitative studies within an unlimited timeframe will be considered for inclusion in this review, in order to increase the breadth of the results and so not to miss any pertinent earlier studies. To

keep textual information of current opinion and policy relevant and up to date, the timeframe will be the past 10 years (2002 – 2012).

The databases to be searched include:

PubMed

PsycINFO

CINAHL

Embase

Scopus

Web of Science

Mednar

Proquest Dissertations and Theses

Index to Theses

Australian Digital Theses Program

The Networked Digital Library of Theses and Dissertations (NDLDT)

Keywords to be used for the initial search of PubMed and CINAHL will include:

Language development	Parents	Child and preverbal language
Language development[mh] Language development disorders[mh] Language development[tiab] Speech delay*[tiab] Language delay*[tiab] Delayed language[tiab] Delayed speech[tiab] Communication[mh:noexp] Verbal behavior[mh]	Parent*[tiab] Parents[mh] Mother child relations[mh] Mother*[tiab] Father*[tiab] Child of impaired parents[mh] Parent-child relations[mh] Parent child[tiab] Father child[tiab] Mother child[tiab] Maternal behavior[mh] Maternal[tiab] Paternal[tiab] Object attachment[mh:noexp] Attachment[tiab] Bonding[tiab]	Babbling[tiab] Cooing[tiab] Child language[tiab] Nonverbal communication[mh] Preverbal[tiab] Prelinguistic[tiab]

The search for textual information will also include relevant websites in English, related to child development, literacy, parent-infant attachment, government policy on early childhood development and education, and media releases relating to the review question. An initial search to identify a comprehensive list of relevant websites for grey literature will be done through the Google search engine using initial key words seen above and additional keywords including:

Government policy

Early childhood

Parent education

Parent training

Infant mental health

Expert opinion(s)

Individual countries (eg Australia, New Zealand, Canada, America, United Kingdom)

Examples of potential grey literature sites include:

Australian Government Department of Health and Ageing

## **Assessment of methodological quality**

Quantitative papers selected for retrieval will be assessed by two independent reviewers for methodological validity prior to inclusion in the review using standardised critical appraisal instruments from the Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI-MASStARI) (Appendix I). Textual papers selected for retrieval will be assessed by two independent reviewers for authenticity prior to inclusion in the review using standardised critical appraisal instruments from the Joanna Briggs Institute Narrative, Opinion and Text Assessment and Review Instrument (JBI-NOTARI) (Appendix I). Any disagreements that arise between the reviewers will be resolved through discussion, or with a third reviewer.

## **Data collection**

Quantitative data will be extracted from papers included in the review using the standardised data extraction tool from JBI-MASStARI (Appendix II). Textual data will be extracted from papers included in the review using the standardised data extraction tool from JBI-NOTARI (Appendix II). The data extracted will include specific details about the interventions, populations, study methods and outcomes of significance to the review question and specific objectives.

## **Data synthesis**

Quantitative papers will, where possible, be pooled in statistical meta-analysis using JBI-MASStARI. All results will be subject to double data entry. Effect sizes expressed as relative risk for cohort studies and odds ratio for case control studies (for categorical data) and weighted mean differences (for continuous data) and their 95% confidence intervals will be calculated for analysis. A Random effects model will be used and heterogeneity will be assessed statistically using the standard Chi-square. Where statistical pooling is not possible the findings will be presented in narrative form including tables and figures to aid in data presentation where appropriate.

Textual papers will, where possible be pooled using JBI-NOTARI. This will involve the aggregation or synthesis of conclusions to generate a set of statements that represent that aggregation, through assembling and categorising these conclusions on the basis of similarity in meaning. These categories are then subjected to a meta-synthesis in order to produce a single comprehensive set of synthesised findings that can be used as a basis for evidence-based practice. Where textual pooling is not possible the conclusions will be presented in narrative form.

## **Conflicts of interest**

The primary reviewer is not aware of any conflicts of interest at the time of submitting the systematic review protocol.

## **Acknowledgements**

The primary reviewer would like to acknowledge the support of the secondary reviewer, Matthew Kowald; her principal supervisor, Dr Aye Aye Gyi from the Joanna Briggs Institute, University of Adelaide; her associate supervisor, Dr Debbie James from Research and Evaluation Unit, Children, Youth and Women's Health Service, and Maureen Bell, Research Librarian for Mental Health, Psychiatry, Psychology, University of Adelaide.

As this systematic review forms partial submission for the award of Masters of Clinical Sciences degree, a secondary reviewer will be used for critical appraisal only.

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# Appendix I - Appraisal instruments

## MAStARI Critical appraisal instruments

### JBI Critical Appraisal Checklist for Comparable Cohort/ Case Control

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is sample representative of patients in the population as a whole?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are the patients at a similar point in the course of their condition/illness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Has bias been minimised in relation to selection of cases and of controls?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Are confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include                     Exclude                     Seek further info.

Comments (Including reason for exclusion)

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## JBI Critical Appraisal Checklist for Descriptive / Case Series

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Was study based on a random or pseudo-random sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were the criteria for inclusion in the sample clearly defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Were confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. If comparisons are being made, was there sufficient descriptions of the groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:      Include                       Exclude                       Seek further info

Comments (Including reason for exclusion)

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**JBI Critical Appraisal Checklist for Narrative,  
Expert opinion & text**

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is the source of the opinion clearly identified?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Does the source of the opinion have standing in the field of expertise?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Are the interests of patients/clients the central focus of the opinion?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is the opinion's basis in logic/ experience clearly argued?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Is the argument developed analytical?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there reference to the extant literature/evidence and any incongruency with it logically defended?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Is the opinion supported by peers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include             Exclude             Seek further info

Comments (Including reason for exclusion)

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# Appendix II - Data extraction instruments

## MAStARI data extraction instrument

### JBI Data Extraction Form for Experimental / Observational Studies

Reviewer ..... Date .....

Author ..... Year .....

Journal ..... Record Number .....

#### Study Method

RCT  Quasi-RCT  Longitudinal

Retrospective  Observational  Other

#### Participants

Setting \_\_\_\_\_

Population \_\_\_\_\_

#### Sample size

Group A \_\_\_\_\_ Group B \_\_\_\_\_

#### Interventions

Intervention A \_\_\_\_\_

Intervention B \_\_\_\_\_

Authors Conclusions: \_\_\_\_\_

\_\_\_\_\_

Reviewers Conclusions: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Study results

### Dichotomous data

Outcome	Intervention ( ) number / total number	Intervention ( ) number / total number

### Continuous data

Outcome	Intervention ( ) number / total number	Intervention ( ) number / total number

**NOTARI data extraction instrument**

**JBI Data Extraction for Narrative, Expert opinion & text**

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

**Study Description**

Type of Text:

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Those Represented:

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Stated Allegiance/ Position:

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Setting

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Geographical

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Cultural

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Logic of Argument

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Data analysis

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Authors Conclusions

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Reviewers Comments

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Data Extraction Complete

Yes

No



## Appendix B: Studies Included for Critical Appraisal

Critical appraisal occurred prior to narrowing the inclusion criteria from the original systematic review protocol. This explains why there are a larger number of references listed below, than were included in the systematic review (Chapter Four). The terms and definitions used for the development of the Maternal Responsiveness Conceptual Framework (Chapter Three) were extracted from all the papers listed under, ‘included following appraisal’.

### **Included following appraisal (PRD terms and definitions from these papers were used to inform the conceptual framework, Chapter 3)**

- Alston, E., & James-Roberts, I. S. (2005). Home environments of 10-month-old infants selected by the WILSTAAR screen for pre-language difficulties. *International Journal of Language and Communication Disorders, 40*(2), 123-136.
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## Excluded Following Appraisal

Citation	Reason
Balog, H. L. (2010). A comparison of maternal and child intonation: does adult input support child production? <i>Infant Behavioural Development</i> , 33(3), 337-345. doi: 10.1016/j.infbeh.2010.04.001	Lack of information regarding outcome measures.
Barwick, M. A., Cohen, N. J., Horodezky, N. B., & Lojkasek, M. (2004). Infant communication and the mother-infant relationship: The importance of level of risk and construct measurement. <i>Infant Mental Health Journal</i> , 25(3), 240-266. doi: 10.1002/imhj.20000	Measures of PRD not defined clearly or in enough detail.
Gros-Louis, J., & Wu, Z. (2012). Twelve-month-olds' vocal production during pointing in naturalistic interactions: Sensitivity to parents' attention and responses. <i>Infant Behavior &amp; Development</i> , 35(4), 773-778.	Appears to be incongruence in statistics between the paper's Figure 3 and Table 1. No response from attempted contact with author.
Hann, D. M., Osofsky, J. D., & Culp, A. M. (1996). Relating the adolescent mother-child relationship to preschool outcomes. <i>Infant Mental Health Journal</i> , 17(4), 302-309. doi: 10.1002/(sici)1097-0355(199624)17:4<302::aid-imhj2>3.0.co;2-o	Risk of selection bias due to change in <i>N</i> without explanation.
Hoff-Ginsberg, E. (1990). Maternal speech and the child's development of syntax: a further look. <i>Journal of Child Language</i> , 17(1), 85-99.	Only 3/9 criteria met in the context of question four being unclear and limited reporting of sample population coding procedures and descriptions of terms.
Low, J. M., & Moely, B. E. (1988). Early word acquisition: Relationships to syntactic and semantic aspects of maternal speech. <i>Child Study Journal</i> , 18(1), 47-59.	Mother's diaries were not considered reliable given there is no other outcome measure to validated the diaries.
MacTurk, R. H., Meadow-Orlans, K. P., Koester, L. S., & Spencer, P. E. (1993). Social support, motivation, language, and interaction: A longitudinal study of mothers and deaf Infants. <i>American Annals of the Deaf</i> , 138(1), 19-25.	Measures of parental responsiveness not defined clearly or in enough detail.
Madden, J., O'Hara, J., & Levenstein, P. (1984). Home again: Effects of the Mother-Child Home Program on mother and child. <i>Child Development</i> , 55(2), 636-647.	Only 2/10 criteria met. Reporting of statistics are unclear and confusing, therefore would not be able to extract statistical data accurately.
Masur, E. F., & Olson, J. (2008). Mothers' and infants'	No for question nine. Difficulty

Citation	Reason
responses to their partners' spontaneous action and vocal/verbal imitation. <i>Infant Behavior and Development</i> , 31(4), 704-715.	understanding statistics therefore would not be able to extract accurately.
Naigles, L. R., & Hoff-Ginsberg, E. (1998). Why are some verbs learned before other verbs? Effects of input frequency and structure on children's early verb use. <i>Journal of Child Language</i> , 25(1), 95-120.	Automatically excluded because did not meet question eight, regarding reliability.
Nathanson, A. I., & Rasmussen, E. E. (2011). TV viewing compared to book reading and toy playing reduces responsive maternal communication with toddlers and preschoolers. <i>Human Communication Research</i> , 37(4).	Reviewer realized after critical appraisal that the statistics combine ages of children who are excluded from the systematic review.
Ninio, A. (1980). Picture-book reading in mother-infant dyads belonging to two subgroups in Israel. <i>Child Development</i> , 51(2), 587-590. doi: 10.2307/1129299	Poor reporting and quality. Did not meet any of the criterion.
Petersen, G. A., & Sherrod, K. B. (1982). Relationship of maternal language to language development and language delay of children. <i>American Journal of Mental Deficiency</i> , 86(4), 391-398.	Measures of parental responsiveness not defined clearly or in enough detail.
Power, D. J., Wood, D. J., Wood, H. A., & MacDougall, J. (1990). Maternal control over conversations with hearing and deaf infants and young children. <i>First Language</i> , 10(28, Pt 1), 19-35. doi: 10.1177/014272379001002802	Doesn't meet minimum criteria to pass critical appraisal. Potential bias with participants.
Seitz, S., & Stewart, C. (1975). Imitation and expansions: Some developmental aspects of mother-child communications. <i>Developmental Psychology</i> , 11(6).	Doesn't meet minimum criteria to pass critical appraisal.
Vitale, G. R. (1998). <i>Maternal responsivity at 9- and 15-months and subsequent language outcomes in a sample of Italian-Canadian mother-child dyads</i> . 60, ProQuest Information & Learning, US. Retrieved from <a href="http://proxy.library.adelaide.edu.au/login?url=http://search.ebscohost.com/login.aspx?direct=true&amp;db=psyh&amp;AN=2000-95004-048&amp;site=ehost-live&amp;scope=site">http://proxy.library.adelaide.edu.au/login?url=http://search.ebscohost.com/login.aspx?direct=true&amp;db=psyh&amp;AN=2000-95004-048&amp;site=ehost-live&amp;scope=site</a> Available from EBSCOhost psych database.	Statistics cover only selective elements. Correlations are not provided even though they were used to decide what went into regressions.



## Appendix C: Statements of Authorship

### Statement of Authorship

Title of Paper	The Value of Flexible Research Protocols when Systematically Reviewing Complex Social Constructs: A Worked Example About Parental Responsiveness
Publication Status	<input checked="" type="checkbox"/> Submitted for Publication
Publication Details	Saliba Luppino, M., Tivey, D. R., & Attard, M. (submitted Jan 2016). The value of flexibly research protocols when systematically reviewing complex social constructs: A worked example about parental responsiveness. <i>International Journal of Social Research Methodology</i> .

#### Principal Author

Name of Principal Author (Candidate)	Melissa Saliba Luppino
Contribution to the Paper	Conception and design; analysis and interpretation of data; writing and critically reviewing the manuscript; gave final approval of the version to be published; acted as corresponding author.
Overall percentage (%)	95%
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	Date <u>23/3/16</u>

#### Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:

- i. the candidate's stated contribution to the publication is accurate (as detailed above);
- ii. permission is granted for the candidate to include the publication in the thesis; and
- iii. the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr David Tivey
Contribution to the Paper	Supervised development of work; provided guidance regarding amendments to the original systematic review protocol; helped to evaluate and edit the manuscript; gave final approval of the version to be published.
Signature	Date <u>23/3/16</u>

Name of Co-Author	Dr Melanie Attard
Contribution to the Paper	Helped to evaluate, structure, critically review and edit the manuscript; gave final approval of the version to be published.
Signature	Date <u>28/3/16</u>

# Statement of Authorship

Title of Paper	Towards a Conceptual Framework for the Constructs of Maternal Responsiveness and Directiveness
Publication Status	<input checked="" type="checkbox"/> Submitted for Publication
Publication Details	Saliba Luppino, M., James, D. H., & Tivey, D. R. (submitted Jan 2016). Towards a conceptual framework for the constructs of maternal responsiveness/directiveness. <i>Parenting: Science and Practice</i> .

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Name of Principal Author (Candidate)	Melissa Saliba Luppino
Contribution to the Paper	Conception and design (conceptualised the topic, developed the coding system and conceptual framework); analysis and interpretation of data (extracted the data, coded data into the framework, interpreted results); writing and critically reviewing the manuscript; gave final approval of the version to be published; acted as corresponding author.
Overall percentage (%)	95%
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	Date 23/3/16

## Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:  
 the candidate's stated contribution to the publication is accurate (as detailed above);  
 permission is granted for the candidate to include the publication in the thesis; and  
 the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr Deborah James
Contribution to the Paper	Conception and design/analysis and interpretation of data (helped to clarify conceptual coding issues and conduct coding reliability checks); helped to evaluate, critically review, structure and edit the manuscript; gave final approval of the version to be published.
Signature	Date

Name of Co-Author	Dr David Tivey
Contribution to the Paper	Conception and design/analysis and interpretation of data (supervised development of work, helped to clarify coding challenges); helped to evaluate and edit the manuscript; gave final approval of the version to be published.
Signature	Date 23/3/16

# Statement of Authorship

Title of Paper	The Association between Children's Language Development and Early Parental Contingent Responsiveness: A Systematic Review
Publication Status	<input checked="" type="checkbox"/> Submitted for Publication
Publication Details	Saliba Luppino, M., Tivey, D. R., James, D. H., & Attard, M. (submitted Jan 2016). The association between children's language development and early parental contingent responsiveness: A systematic review. <i>Journal of Child Language</i> .

## Principal Author

Name of Principal Author (Candidate)	Melissa Saliba Luppino
Contribution to the Paper	Conception and design/analysis and interpretation of data (developed and performed comprehensive systematic review search and eligibility screening; critical appraisal of included studies; data extraction; metaanalysis and data synthesis; writing and critically reviewing the manuscript; gave final approval of the version to be published; acted as corresponding author.
Overall percentage (%)	90%
Certification:	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature and is not subject to any obligations or contractual agreements with a third party that would constrain its inclusion in this thesis. I am the primary author of this paper.
Signature	Date 23/3/16

## Co-Author Contributions

By signing the Statement of Authorship, each author certifies that:  
 the candidate's stated contribution to the publication is accurate (as detailed above);  
 permission is granted for the candidate to include the publication in the thesis; and  
 the sum of all co-author contributions is equal to 100% less the candidate's stated contribution.

Name of Co-Author	Dr David Tivey
Contribution to the Paper	Conception and design/analysis and interpretation of data (supervised development of work; assisted in choice of meta-analytical approach and software, and data entry for meta-analysis; assisted in data interpretation); helped to critically review, evaluate and edit the manuscript; gave final approval of the version to be published.
Signature	Date 23/5/16.

Name of Co-Author	Dr Deborah James
Contribution to the Paper	Conception and design (involved in protocol peer-review process); interpretation of data; helped to critically review, evaluate and edit the manuscript; contributed conceptual knowledge about child language development; gave final approval of the version to be published.
Signature	Date 21/4/16

Name of Co-Author	Dr Melanie Attard
Contribution to the Paper	Conception and design; Helped to critically review, evaluate and edit the manuscript; gave final approval of the version to be published.
Signature	Date 28/3/16.

# Appendix D: Systematic Review Appraisal instruments

## MAStARI critical appraisal instruments

### JBI Critical Appraisal Checklist for Descriptive / Case Series

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Was study based on a random or pseudo-random sample?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Were the criteria for inclusion in the sample clearly defined?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Were confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Were outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. If comparisons are being made, was there sufficient descriptions of the groups?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:      Include                   Exclude                   Seek further info

Comments (Including reason for exclusion)

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## JBI Critical Appraisal Checklist for Comparable Cohort/ Case Control

Reviewer ..... Date .....

Author ..... Year ..... Record Number .....

	Yes	No	Unclear	Not Applicable
1. Is sample representative of patients in the population as a whole?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Are the patients at a similar point in the course of their condition/illness?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Has bias been minimised in relation to selection of cases and of controls?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Are confounding factors identified and strategies to deal with them stated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Are outcomes assessed using objective criteria?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Was follow up carried out over a sufficient time period?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Were the outcomes of people who withdrew described and included in the analysis?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Were outcomes measured in a reliable way?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Was appropriate statistical analysis used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Overall appraisal:    Include             Exclude             Seek further info.

Comments (Including reason for exclusion)

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## JBI Critical Appraisal Checklist for Experimental Studies

Design: Randomised Control Trial / Pseudo-randomised Trial

Criteria	Yes	No	Unclear	Not Applicable	Comment
1) Was the assignment to treatment groups truly random?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
2) Were participants blinded to treatment allocation?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
3) Was allocation to treatment groups concealed from the allocator?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
4) Were the outcomes of people who withdrew described and included in the analysis ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
5) Were those assessing outcomes blind to the treatment allocation?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
6) Were the control and treatment groups comparable at entry?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
7) Were groups treated identically other than for the named interventions?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
8) Were outcomes measured in the same way for all groups?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
9) Were outcomes measured in a reliable way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>
10) Was appropriate statistical analysis used?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="text"/>

Include

Reason



## Critical appraisal guide sheet for Descriptive Studies

Question	Yes	No	Unclear	N/A
1. Was the study based on a random sample or pseudo-random sample?	a. Stated and explained methods of how random sample obtained	a. Not stated b. Randomization stated, but no methods explained c. Sample from mail-outs, birth notices, waiting lists.	Neither Yes or No	
2. Were the criteria for inclusion in the sample clearly defined?	a. Explicitly states it is inclusion/exclusion criteria, before the fact of obtaining the sample population, AND clearly defined for children (eg: age, developmental status, gestational age at birth, hearing status, gender) and parents (not as critical – but look for info on SES, ethnicity, age, single parent/couple, mental health, hearing status, language skills) b. Inclusion/exclusion stated but detail lacking/not extensive enough. NOTE: put a qualifying note in the comments box of the Critical Appraisal sheet.	a. No inclusion/exclusion criteria stated b. No sample described at all c. Very limited description – only a couple of characteristics mentioned	sample is described but there is no explicit statement that it is an inclusion/exclusion criteria. Ie don't know if sample was based on criteria before collection, or if description occurs after sample obtained.	
3. Were confounding factors identified and strategies to deal with them stated?	Mention of at least 1 factor considered by the reviewers to be a confounding factor, plus statement of strategies to deal with them. Examples include, but not limited to: <ul style="list-style-type: none"> <li>Length of videotaping samples eg modifying cut off time to X minutes to make all samples equal</li> <li>Location, time, or activities chosen for parent-child interaction sampling (eg accounting for child's levels of alertness during different times of the day)</li> <li>Influence of the person behind the videotape</li> <li>Reliability of coding, secondary coders etc.</li> </ul>	Reviewer thinks no confounding factors are mentioned at all	Confounding factors mentioned, but limited information on strategies to deal with them. NOTE: make qualifying note in the comments box of CA form.	
4. Were outcomes assessed using objective criteria?	a. Formal/standardized/clinically accepted assessments used E.g: <ul style="list-style-type: none"> <li>PPVT, CELF, PLS, MLU</li> <li>HOME, NCAST</li> </ul> b. Self-developed or adapted tools acceptable, as long as descriptions are given (eg coding rules, definitions) <ul style="list-style-type: none"> <li>Sentence complexity, diversity of parent vocabulary,</li> <li>Number of tokens, coding elements of responsiveness</li> </ul>	a. Not objective form of assessment b. Not described in clear enough detail to determine objectivity	Not formal/standardized or typical form of assessment but appears objective AND limited description of analysis system.	
5. If comparisons made, was there sufficient descriptions of groups?	Up to rater's judgment	Up to rater's judgment	Unclear whether comparisons are being made or if there is sufficient description.	No comparisons are made
6. Was follow up carried out over a sufficient time period?	Any time period will be sufficient as language is continually developing	n/a	n/a	Concurrent measures at one time point
7. Were the outcomes of people who withdrew described and included in the analysis?	a. Withdrawals stated and outcome stated. b. Statistics used to 'impute' missing data	a. Can see that withdrawal in N in tables or text b. Stated there are withdrawals, but no outcomes are stated.	n/a	No withdrawals evident in the numbers (N) or paper states there are no withdrawals.
8. Were outcomes measured in a reliable way?	a. Intra or inter-rater reliability measures reported for rating/coding procedures b. Formal/standardized assessments used preferably internal test reliability reported c. Maternal diaries accepted if training provided to mothers, and reliability reported, or diary results correlated with another form of reliable language outcome measure.	a. No child language outcome reliability measures reported b. Maternal diaries – when not correlated with another reliable language outcome measure	If doesn't meet criteria guidelines for Yes or No	n/a as all studies have outcomes to be measured
9. Was appropriate statistical analysis used?	Raters were referred to 'statistics' lecture notes from course core component for Question 9.			

## Appendix E. Systematic Review Data Extraction Instruments for Responsiveness Terms and Definitions, and Statistical Data

	A	B	C	D	E	F	G	H
1	<b>Descriptive Papers - Maternal Responsiveness elements/definitions</b>							
2	My Coding/notes	Author	Date	Name of element of MR in paper	Definition of Element	Coded/Assessed by	Setting/duration	Age of child
3	Example:	JONES, A	2012	imitation	mother copies infant's verbalisation or gesture	own coding system. Described page X	in lab. Age appropriate toys provided. 10 minute observation	10 months
4								

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
	Author	Date	EN	Stats methods used	Notes	N	Parental Responsiveness Unit				Language Outcome				Correlations	multiple regression	R <sup>2</sup>	Change to R <sup>2</sup>	Chi Square goodness-of-fit	Baseline and Fitted X <sup>2</sup>	Change to X <sup>2</sup> (1 d.f.)	
							Author's label & child age in months	age (months)	M	SD		Author's label & child age in months	age (months)	M	SD							
1																						
2	Bornstein et al (japanese mothers...)	1997	43	MR1 scored as the frequency of intervals in which mothers responded. "basic correlations"	incorporates prompt and appropriate	31	MR1	Contingent response to infant non-distress	5m	22%	(range 0-51%)	L1	Cattell Infant Test (MCC baby test) (N=27)	17m	120.8	(range 96-142)	MR1xL1=.48** (p<.01)	n/r	n/r	n/r	n/a	n/a
3							n/a	n/a	n/a	n/a	n/a	L2	PPVT (N=26)	32m	22.6	(range 13-39)	MR1xL2=.14	n/r	n/r	n/r	n/a	n/a
4							n/a	n/a	n/a	n/a	n/a	L3	Dyadic attention (attention to mother eq looks)	5m	31%	(range 7-60%)	MR1xL3=.30* (p<.05)	n/r	n/r	n/r	n/a	n/a
5							n/a	n/a	n/a	n/a	n/a	L4	Nondistress vocalisation	5m	32%	(range 2-82%)	MR1xL4=.45** (p<.01)	n/r	n/r	n/r	n/a	n/a
6																						
7																						

Key: EN = Endnote number, M = mean, SD = standard deviation, MR = maternal responsiveness.

## Appendix F: Studies Excluded from Systematic Review

### Following Examination of Full Text

#### Reasons related to study type ( $N = 62$ )

##### Study type: Case series or case study ( $n = 27$ )

- Alpert, C. L., & Kaiser, A. P. (1992). Training parents as milieu language teachers. *Journal of Early Intervention, 16*(1), 31-52. doi: 10.1177/105381519201600104
- Bateson, M. C. (1975). Mother-infant exchanges: the epigenesis of conversational interaction. *Annals of the New York Academy of Sciences 263*, 101-113.
- Barrett, M., Harris, M., & Chasin, J. (1991). Early lexical development and maternal speech: a comparison of children's initial and subsequent uses of words. *Journal of Child Language, 18*(1), 21-40.
- Camaioni, L., Aureli, T., Bellagamba, F., & Fogel, A. (2003). A longitudinal examination of the transition to symbolic communication in the second year of life. *Infant and Child Development, 12*(1), 1-26. doi: 10.1002/icd.333
- Camaioni, L., & Laicardi, C. (1985). Early social games and the acquisition of language. *British Journal of Developmental Psychology, 3*(1), 31-39. doi: 10.1111/j.2044-835X.1985.tb00952.x
- Crowe, L. K., Norris, J. A., & Hoffman, P. R. (2000). Facilitating storybook interactions between mothers and their preschoolers with language impairment. *Communication Disorders Quarterly, 21*(3), 131-146. doi: 10.1177/152574010002100302
- Drummond, J. E., Weir, A. E., & Kysela, G. M. (2002). Home visitation practice: models, documentation, and evaluation. *Public Health Nursing, 19*(1), 21-29.
- Delaney E., & Kaiser, A. P. (1997). *Teaching parents who are economically disadvantaged to be responsive to children's language and to effectively manage noncompliant behaviors* [Ed.D. M3 - 9817280]. Tennessee: Peabody College for Teachers of Vanderbilt University.
- Eldridge-Hunter, D. (1992). Intergenerational literacy: Impact on the development of the storybook reading behaviors of Hispanic mothers. *National Reading Conference Yearbook. 41*:101-10.
- Fowler, W., Ogston, K., Roberts-Fiati, G., & Swenson, A. (1993). Accelerating language acquisition. *Ciba Found Symp. 178*:207-17; discussion 17-21.
- Gale, E., & Schick, B. (2009). Symbol-infused joint attention and language use in mothers with deaf and hearing toddlers. *American Annals of the Deaf. 2009*;153(5):484-503.
- Hancock, T. B., Kaiser, A. P., & Delaney, E. M. A. (2002). Teaching Parents of Preschoolers at High Risk. Strategies to Support Language and Positive Behavior. *Topics in Early Childhood Special Education. 22*(4).
- Harris M., Barrett M., Jones D., & Brookes S. (1988). Linguistic input and early word meaning. *Journal of Child Language. 15*(1):77-94.
- Hess, L. J. (1999). Let's talk and play: A study of poverty mothers and toddler daughters. *Infant-Toddler Intervention. 9*(1):1-16.
- Hockenberger, E. H., Goldstein, H., & Haas, L. S. (1999). Effects of Commenting during Joint Book Reading by Mothers with Low SES. *Topics in Early Childhood Special Education. 19*(1):15-27.



- Hoff-Ginsberg, E. A. (1987). Topic Relations in Mother-Child Conversation. *First Language*. 7(2).
- Hopkins, B. (1983). The development of early non-verbal communication: an evaluation of its meaning. *Journal of Child Psychology and Psychiatry*. 1983 Jan;24(1):131-44.
- Hornby, G, & Jensen-Procter, G. (1984). Parental speech to language delayed children: A home intervention study. *British Journal of Disorders of Communication*. 19(1):97-103.
- Kwong, T., & Nicoladis, E. (2005). Talk to me: parental linguistic practices may hold the key to reducing incidence of language impairment and delay among multiple-birth children. *Journal of Speech-Language Pathology & Audiology*. 29(1):6-13.
- la Higuera Amato, C. A, & Fernandes, F. D. (2011). Functional aspects of communication: a longitudinal study of the first three years of life. *Jornal da Sociedade Brasileira de Fonoaudiologia*. Sep;23(3):277-80.
- O'Neill, M., Bard, K. A., Linnell, M., & Fluck, M. (2005). Maternal gestures with 20-month-old infants in two contexts. *Developmental science*. Jul;8(4):352-9.
- Otomo, K. (2001). Maternal responses to word approximations in Japanese children's transition to language. *Journal of Child Language*. 28(1):29-57.
- Peterson, P., Carta, J. J., & Greenwood, C. (2005). Teaching Enhanced Milieu Language Teaching Skills to Parents in Multiple Risk Families. *Journal of Early Intervention*. 27(2):94-109.
- Schlansker, J. T. (1982). Mother-Infant Face-to-Face Interactions and the Organization of Attention. *Journal of Genetic Psychology*. 140(1):153-4.
- Tardaguila-Harth, J. M. (2011). *Assessing the effects of dialogic reading on the oral language skills of migrant preschoolers at risk for reading difficulties*. US: ProQuest Information & Learning.
- Tomasello, M., & Todd, J. (1983). Joint attention and lexical acquisition style. *First Language*. 4(12, Pt 3):197-211.
- Veneziano, E., Sinclair, H., & Berthoud, I. (1990). From one word to two words: repetition patterns on the way to structured speech. *Journal of Child Language*. Oct;17(3):633-50.

### **Study type: Qualitative (n = 5)**

- Dowd, T., Withers, E., Hackwood, J., & Shuter, P. (2007). An Australian pilot study of a parent-child interaction program - "You make the difference.". *Neonatal, Paediatric & Child Health Nursing*. 10(1):13-9.
- Glascoe, F.P., & Leew, S. (2010). Parenting behaviors, perceptions, and psychosocial risk: impacts on young children's development. *Pediatrics*. 125(2):313-9.
- Lee, A. (1996). Waiting for speech therapy: a group to help the under-3s. *Professional Care of Mother and Child*. 6(4):105-8.
- Lynch, L., & Bemrose, S. (2005). It's good to talk: pre- and post-birth interaction. *Practicing Midwife*. Mar;8(3):17-20.
- McCathren, R. B. (2010). Case study: Parent-implemented prelinguistic milieu teaching with a high risk dyad. *Communication Disorders Quarterly*. 31(4):243-52.

### **Study type: Expert opinion (n = 12)**

- Abrams, M. A., Klass, P., & Dreyer, B. P. (2009). Health literacy and children: recommendations for action. *Pediatrics*. 124(SUPPL. 3):S327-S31.

- Anderson, B. J. (1977). The Emergence of Conversational Behavior. *Journal of Communication*. 27(2):85-91.
- Bornstein, M. H., & Tamis-LeMonda, C. (1989). *Maternal responsiveness and cognitive development in children*. In: Bornstein, M. H, editor. *Maternal responsiveness: characteristics and consequences*. San Francisco: Jossey-Bass Inc; p. 49-61.
- Bortfeld, H. (2004). Which came first: Infants learning language or motherese? *Behavioral and Brain Science*. 27(4):505-6.
- Day, C. (2007). *Attachment and Early Language Development: Implications for Early Intervention*. Routledge. , 325 Chestnut Street Suite 800, Philadelphia, PA 19106. p. 8.
- Fowler, W., & Swenson, A. (1976). *The Influence of Early Stimulation on Language Development*. p. 26.  
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<http://proxy.library.adelaide.edu.au/login?url=http://search.proquest.com/docview/63976266?accountid=8203>
- Girolametto, L. (1995). Reflections on the Origins of Directiveness: Implications for Intervention. *Journal of Early Intervention*. 19(2):104-6.
- Maxwell, M. M. (1993). Linguistic theories and language interaction. *ASHA Monographs*. 1993(30):1-9.
- Sande, D. R., & Billingsley, C. S. (1985) Language development in infants and toddlers. *Nurse Practitioner*. Sep;10(9):39-47.
- Smeyers, P. (2008). Child-Rearing: On Government Intervention and the Discourse of Experts. *Educational Philosophy and Theory*. 40(6):719-38.
- Van Balkom, L. J. M. (1987). Early assessment of communicative abilities by means of caregiver/child-interaction analysis. *International Journal of Rehabilitation Research*. 10(4 SUPPL. 5):79-85.
- Woodfield, T. A. (1999). The acquisition of speech and language. *Journal of child health care: for professionals working with children in the hospital and community*. Autumn;3(3):35-8.

### **Study Type: Review (n = 7)**

- Abkarian, G. G., Dworkin, J. P., & Abkarian, A. K. (2003) Fathers' Speech to Their Children: Perfect Pitch or Tin Ear? *Fathering*. 1(1):27-50.
- Cooper, R. P., & Aslin, R. N. (1989). The language environment of the young infant: Implications for early perceptual development. *Canadian Journal of Psychology/Revue canadienne de psychologie*. 43(2):247-65.
- Magill-Evans, J., Harrison, M. J., Rempel, G., & Slater, L. (2006). Interventions with fathers of young children: systematic literature review. *Journal of Advanced Nursing*. Jul;55(2):248-64.
- Olds, D. L., Sadler, L., & Kitzman, H. (2007). Programs for parents of infants and toddlers: Recent evidence from randomized trials. *Journal of Child Psychology and Psychiatry*. 48(3-4):355-91.
- Regalado, M., & Halfon, N. (2001). Primary care services promoting optimal child development from birth to age 3 years: review of the literature. *Archives of Pediatrics and Adolescent Medicine*. Dec;155(12):1311-22.
- Shin, H., Park, Y-J., Ryu, H., & Seomun, G-A. (2008). Maternal sensitivity: A concept analysis. *Journal of Advanced Nursing*. 64(3):304-14.
- Tamis-LeMonda, C. S., & Bornstein, M. H. (2002). Maternal responsiveness and early language acquisition. *Advances in Child Development and Behavior*. 29:89-127.

### **Study type: Book section (n = 10)**

- Adamson, L. B., Bakeman, R., & Deckner, D. F. (2005). *Infusing Symbols Into Joint Engagement: Developmental Themes and Variations*. In: Namy L. L., editor. *Symbol use and symbolic representation: Developmental and comparative perspectives*. Mahwah, NJ US: Lawrence Erlbaum Associates Publishers; p. 171-95.
- Bodin, L., & Snow, C. E. (1994). *What Kind of a Birdie Is This? Learning to Use Superordinates*. In: Sokolov J. L., & Snow, C. E., editors. *Handbook of research in language development using children*: Hillsdale, N. J.: L. Erlbaum Associates; p. 77-109.
- de Boer, B. (2005). *Infant-directed speech and evolution of language*. In: Tallerman M, editor. *Language origins: Perspectives on evolution*. New York, NY US: Oxford University Press. p. 100-21.
- de Jong, J. (1996). Review of 'Input and interaction in language acquisition'. *Clinical Linguistics and Phonetics*.10(1):73-5.
- Fernald, A. (1991). *Prosody in speech to children: Prelinguistic and linguistic functions*. In: Vasta R, editor. *Annals of child development*, Vol 8. London England: Jessica Kingsley Publishers; p. 43-80.
- Girolametto, L. E. (1988). *Developing dialogue skills: The effects of a conversational model of language intervention*. In: Marfo, K., editor. *Parent-child interaction and developmental disabilities: Theory, research, and intervention*. New York, NY England: Praeger Publishers; p. 145-62.
- Masataka, N. (2000). *The role of modality and input in the earliest stage of language acquisition: Studies of Japanese sign language*. In: Chamberlain, C, Morford, J. P, & Mayberry, R. I, editors. *Language acquisition by eye*. Mahwah, NJ US: Lawrence Erlbaum Associates Publishers; p. 3-24.
- Peters, D. L., Bollin, G.G., Murphy, R. E., (1991). *Head Start's influence on parental competence and child competence*. In: Silvern SB, editor. *Advances in reading/language research: A research annual*, Vol 5: Literacy through family, community, and school interaction. US: Elsevier Science/JAI Press; p. 91-123.
- Tamis-LeMonda, C. S., Cristofaro, T. N., Rodriguez, E. T., & Bornstein, M. H. (2006). *Early Language Development: Social Influences in the First Years of Life*. In: Balter L., Tamis-LeMonda C. S., editors. *Child psychology: A handbook of contemporary issues* (2nd ed). New York, NY US: Psychology Press; p. 79-108.
- Van Egeren, L. A., & Barratt, M. S. (2004). *The developmental origins of communication: Interactional systems in infancy*. In: Vangelisti A. L, editor. *Handbook of family communication*. Mahwah, NJ US: Lawrence Erlbaum Associates Publishers; p. 287-310.

### **Study type: Only abstract accessible (n = 1)**

- Gros-Louis, J. (2009). The influence of maternal responsiveness on the development of pragmatic use of prelinguistic vocalizations in social interactions. *Developmental Psychobiology*. 51(7):587.

### **Reasons related to children (N = 54)**

**Children: Children are too old, MLU too high, or results combine older children with younger children (n = 22)**

- Bedrosian, J. L., Wanska, S. K., Sykes, K. M., Smith, A. J., & Dalton, B. M. (1988). Conversational turn-taking violations in mother-child interaction. *Journal of Speech and Hearing Research*. Mar;31(1):81-6.
- Blom-Hoffman, J., O'Neil-Pirozzi, T., Volpe, R., Cutting, J., & Bissinger, E. (2006). Instructing parents to use dialogic reading strategies with preschool children: Impact of a video-based training program on caregiver reading behaviors and children's related verbalizations. *Journal of Applied School Psychology*. 23(1):117-31.
- Boyce, L. K., Innocenti, M. S., Roggman, L. A., Jump Norman, V. K., & Ortiz E. (2010). Telling stories and making books: Evidence for an intervention to help parents in migrant Head Start families support their children's language and literacy. *Early Education and Development*. 21(3):343-71.
- Cameron, D. L. (2003). *Influence of parenting style on cognitive strategies used by preschoolers*. US: ProQuest Information & Learning.
- Campisi, L., Serbin, L. A., Stack, D. M., Schwartzman, A. E., & Ledingham, J. E. (2009). Precursors of language ability and academic performance: an inter-generational, longitudinal study of at-risk children. *Infant and Child Development*. 18(5):377-403.
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- Conti-Ramsden, G., & Friel-Patti, S. (1984). Mother-child dialogues: A comparison of normal and language impaired children. *Journal of Communication Disorders*. 17(1):19-35.
- Cunningham, C. E., Siegel, L. S., van der Spuy, H. I., Clark M. L., & Bow, S. J. (1985). The behavioral and linguistic interactions of specifically language-delayed and normal boys with their mothers. *Child Development*. Dec;56(6):1389-403.
- Dale, P. S., Crain-Thoreson, C., Notari-Syverson, A., & Cole, K. (1996). Parent-child book reading as an intervention technique for young children with language delays. *Topics in Early Childhood Special Education*. 16(2):213-35.
- De Von Figueroa-Moseley, C., Ramey, C. T., Keltner, B., & Lanzi, R. G. (2006). Variations in Latino Parenting Practices and Their Effects on Child Cognitive Developmental Outcomes. *Hispanic Journal of Behavioral Sciences*. 28(1):102-14.
- Fleming, D. (2002). *Promoting healthy child development: A population health approach* [Ph.D. M3 - NQ68574]: University of Alberta (Canada).
- Kloth, S., Janssen, P., Kraaimaat, F., & Bruten, G. J. (1998). Communicative styles of mothers interacting with their preschool-age children: a factor analytic study. *Journal of Child Language*. Feb;25(1):149-68.
- McGinty, A. S., Justice, L. M., Zucker, T., Gosse, C., & Skibbe, L. E. (2012). Shared-reading dynamics: mothers' question use and the verbal participation of children with specific language impairment. *Journal of Speech Language and Hearing Research*. 55:1039-52.
- Minai, U., Jincho, N., Yamane, N., & Mazuka, R. (2012). What hinders child semantic computation: children's universal quantification and the development of cognitive control. *Journal of Child Language*. 39(5):919-56.

- Nnachetam, A. A. (2011). *Providing parents with young children's performance feedback information: Effects on vocabulary and pre-literacy development*. US: ProQuest Information & Learning.
- Sarsour, K., Sheridan, M., & Jutte, D. (2011). Family socioeconomic status and child executive functions: the roles of language, home environment, and single parenthood. *Journal of International Neuropsychological Society*.
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- Warlaumont, A. S., & Jarmulowicz, L. (2012). Caregivers' suffix frequencies and suffix acquisition by language impaired, late talking, and typically developing children. *Journal of Child Language*. 39(05):1017-42.
- Weizman, Z. O., & Snow, C. E. (2001). Lexical input as related to children's vocabulary acquisition: effects of sophisticated exposure and support for meaning. *Developmental Psychology*. 37(2):265-79.
- Winn, L. L. (2002). Strategies used by Head Start mothers while engaging their child in a picture book: is one strategy more related to child vocabulary scores? *Journal of Family Communication*. 2(4):185-213.

### **Children: Children have hearing impairment ( $n = 3$ )**

- Roberts, J. E., Burchinal, M. R., Jackson, S. C., Hooper, S. R., Roush, J., Mundy, M., et al. (2000). Otitis media in childhood in relation to preschool language and school readiness skills among black children. *Pediatrics*. Oct;106(4):725-35.
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### **Children: Children are premature, very low birth weight or low birth weight ( $n = 20$ )**

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**Reasons relating to input measures of Parental Responsiveness ( $N = 33$ )**

**Input measures: Parental responsiveness is not measured/outcomes are not reported ( $n = 20$ )**

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**Input measures: Measures are based on general parent input (e.g. total words spoken, total child directed speech) rather than explicitly being based on contingent, responsive and appropriate parent responses (n = 13)**

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**Reasons relating to outcome measures (N = 58)**

**Outcome measures: Language outcomes are not measured/reported (n = 37)**

- Adams, J. L., & Ramey, C. T. (1980). Structural aspects of maternal speech to infants reared in poverty. *Child Development*. 51(4):1280-4.

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**Outcome measures: Study is not about the relationship between parental responsiveness and children's language (n = 21)**

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## **Reasons relating to Theses (N = 34)**

### **Theses: Thesis not included because a published article exists, and is already included, about the thesis (n = 5)**

- Baumwell, L. S. A., & Tamis-LeMonda, C. (1993). *Maternal responsiveness and infant language: Comprehension as predictors of language development* [Ph.D. M3 - 9411175]. New York: New York University.
- Deckner, D. F. (2004). *Language and literacy: Effects of parent practices, child interests, and shared book reading*. US: ProQuest Information & Learning.
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**Theses: Thesis could not be retrieved in full text ( $n = 29$ )**

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