

# **Early Functions of Pointing: The Importance of Routines in Communicative Development**

**by**

**Viktoria Aranka Kettner**

B.B.A., Simon Fraser University, 2006

Thesis Submitted in Partial Fulfillment of the  
Requirements for the Degree of  
Master of Arts

in the

Department of Psychology  
Faculty of Arts and Social Sciences

**© Viktoria Aranka Kettner 2014**

**SIMON FRASER UNIVERSITY**

**Fall 2014**

All rights reserved.

However, in accordance with the *Copyright Act of Canada*, this work may be reproduced, without authorization, under the conditions for "Fair Dealing." Therefore, limited reproduction of this work for the purposes of private study, research, criticism, review and news reporting is likely to be in accordance with the law, particularly if cited appropriately.

## Approval

**Name:** Viktoria Aranka Kettner  
**Degree:** Master of Arts (Psychology)  
**Title:** *Early Functions of Pointing: The Importance of Routines in Communicative Development*  
**Examining Committee:** **Chair:** Robert Ley  
Associate Professor

**Jeremy Carpendale**  
Senior Supervisor  
Professor

---

**Timothy Racine**  
Supervisor  
Associate Professor

---

**Lucy Le Mare**  
External Examiner  
Professor  
Faculty of Education

---

**Date Defended:** December 8, 2014

---

## Partial Copyright Licence



The author, whose copyright is declared on the title page of this work, has granted to Simon Fraser University the non-exclusive, royalty-free right to include a digital copy of this thesis, project or extended essay[s] and associated supplemental files ("Work") (title[s] below) in Summit, the Institutional Research Repository at SFU. SFU may also make copies of the Work for purposes of a scholarly or research nature; for users of the SFU Library; or in response to a request from another library, or educational institution, on SFU's own behalf or for one of its users. Distribution may be in any form.

The author has further agreed that SFU may keep more than one copy of the Work for purposes of back-up and security; and that SFU may, without changing the content, translate, if technically possible, the Work to any medium or format for the purpose of preserving the Work and facilitating the exercise of SFU's rights under this licence.

It is understood that copying, publication, or public performance of the Work for commercial purposes shall not be allowed without the author's written permission.

While granting the above uses to SFU, the author retains copyright ownership and moral rights in the Work, and may deal with the copyright in the Work in any way consistent with the terms of this licence, including the right to change the Work for subsequent purposes, including editing and publishing the Work in whole or in part, and licensing the content to other parties as the author may desire.

The author represents and warrants that he/she has the right to grant the rights contained in this licence and that the Work does not, to the best of the author's knowledge, infringe upon anyone's copyright. The author has obtained written copyright permission, where required, for the use of any third-party copyrighted material contained in the Work. The author represents and warrants that the Work is his/her own original work and that he/she has not previously assigned or relinquished the rights conferred in this licence.

Simon Fraser University Library  
Burnaby, British Columbia, Canada

revised Fall 2013

## Ethics Statement



The author, whose name appears on the title page of this work, has obtained, for the research described in this work, either:

- a. human research ethics approval from the Simon Fraser University Office of Research Ethics,

or

- b. advance approval of the animal care protocol from the University Animal Care Committee of Simon Fraser University;

or has conducted the research

- c. as a co-investigator, collaborator or research assistant in a research project approved in advance,

or

- d. as a member of a course approved in advance for minimal risk human research, by the Office of Research Ethics.

A copy of the approval letter has been filed at the Theses Office of the University Library at the time of submission of this thesis or project.

The original application for approval and letter of approval are filed with the relevant offices. Inquiries may be directed to those authorities.

Simon Fraser University Library  
Burnaby, British Columbia, Canada

update Spring 2010

## **Abstract**

The present longitudinal diary study investigated the development of early functions of pointing within everyday routines in infants between 5 and 22 months of age. There are several theories on how pointing develops. Most current studies on pointing involve experimental settings and infants who have already mastered communicative pointing. The present study analyzed diary observations recorded by parents within everyday routines, focusing on the longitudinal changes in infants' early pointing behaviour. Results are interpreted in terms of historically important findings and theories on the origins and development of pointing. Findings indicate a tendency to use the index finger for tactile exploration and in imitation, as well as a tendency to point with the whole hand, before infants become aware of the social function of their raised arm and index finger. In addition, results suggest that different functions of pointing might emerge along different developmental pathways.

**Keywords:** Pointing; communicative development; gestures; routines; infancy

To my children  
Benjamin and Daniel

## **Acknowledgements**

I thank Dr. Jeremy Carpendale for shaping my fascination with my children's development into academic interests and achievements, for challenging me to question what is often taken for granted, and for all the hours of engaging discussion. I also thank Dr. Tim Racine for encouraging me to consider different perspectives and Dr. Lucy Le Mare for acting as external examiner and providing valuable comments and advice.

I thank my husband, Richard Frank, for the encouragement, advice and feedback, and for always being there to listen. I thank my parents and parents-in-law for teaching by example and for their support and encouragement. Finally, I wish to acknowledge the hard work of the parent participants whose observations formed the basis of this project.

## Table of Contents

Approval .....	ii
Partial Copyright Licence .....	iii
Ethics Statement .....	iv
Abstract .....	v
Dedication .....	vi
Acknowledgements .....	vii
Table of Contents .....	viii
 <b>Chapter 1. Introduction .....</b>	 <b>1</b>
Functions of Pointing .....	3
 <b>Chapter 2. Current Study and Purpose .....</b>	 <b>6</b>
Early Routines .....	7
Method .....	9
 <b>Chapter 3. Analysis of Diary Observations .....</b>	 <b>11</b>
Proto-Declaratives .....	12
Early declaratives .....	13
Related routine: Reading books .....	15
Index finger exploration and pointing-to-touch .....	18
“Dat” .....	20
Imitation .....	20
Asking questions .....	22
Pointing to share attention or interest .....	22
Identifying .....	23
Commenting .....	26
Referring to past events .....	27
Proto-Imperatives .....	28
Request an object .....	29
Request an action .....	34
Request help .....	37
Answer a Question .....	38
Related routine: The “Where Is Game” .....	39
Answer a question about an object .....	40
Answer a question about a goal .....	42
Answer yes-no questions .....	43
 <b>Chapter 4. General Discussion .....</b>	 <b>44</b>
Functions .....	44
Development .....	46



<b>Chapter 5. Conclusion .....</b>	<b>50</b>
<b>References .....</b>	<b>54</b>

# Chapter 1.

## Introduction

Language plays a key role in how we define ourselves as human beings. Researchers and writers in various disciplines such as psychology, philosophy, and anthropology have long been fascinated with the development of human languages and communicative skills that are so ingrained in our everyday lives. Children start to use simple words around their first birthday, but before they learn these first words they quickly become skilled at communicating with gestures. Early pointing behaviour is of great interest, because it is believed that “the pointing gesture, as a joint-attentional behavior, is the first form of referential and intentional communication that is associated with language development” (Colonessi, Stams, Koster, & Noom, 2010, p. 361). Similarly, Werner and Kaplan (1963) argue that “The earliest concrete and clear-cut expressions of reference to objects are, on the one hand, the characteristic bodily gesture of pointing and, on the other, vocal utterances such as ‘da’ or ‘ta’” (p. 77).

Pointing has been studied extensively and a number of theories have been proposed regarding its origins and development. Vygotsky (1978) argued that pointing originates in unsuccessful reaching to grasp and that at the “initial stage pointing is represented by the child’s movement, which seems to be pointing to an object – that and nothing more... When the mother comes to the child’s aid ... the child’s unsuccessful attempt engenders a reaction not from the object he seeks but *from another person*” (p. 56, italics in original). This then results in the child learning to expect a response from the parent and pointing becomes a gesture.

In their discussion of Vygotsky’s view, Carpendale and Carpendale (2010) argue that this view only accounts for the development of pointing to request (proto-imperatives), but does not explain the origins of pointing to share interest or attention

(proto-declaratives). Based on naturalistic diary observations of one infant, Carpendale and Carpendale (2010) found that at first the infant's index finger use seemed to involve touching and exploring objects, and soon after pointing towards out-of-reach objects before getting closer to touch them (pointing-to-touch). Carpendale and Carpendale (2010) argue that pointing is initially a manifestation of infants' orientation towards aspects of their environment, which elicits responses from adults around them. The authors endorse the view that "infants point first as part of their activity and gradually realize the social significance of their action for others" (p. 112). The early use of the index finger for tactile exploration has been reported by others such as Shinn (1900) and Bates, Camaioni, and Volterra (1975).

Similarly, Werner and Kaplan (1963) argue that pointing cannot emerge from grasping, because

Functionally considered, grasping is a behaviour which subserves *incorporation*, taking in; in contrast, the essential characteristic of pointing is that it is DIRECTED OUTWARD, it is an acknowledgement of an object located at a distance from the self. Thus, while grasping is tied up with pragmatic things-of-action, pointing is linked to a world of contemplated objects. (p. 78, italics and upper case in original)

Werner and Kaplan (1963) argue that reaching to touch while exploring the world can be discussed in relation to reference, but reaching to grab cannot. According to these authors, pointing is a skill that helps the infant understand the distinction between herself and other objects in the world. Overall, however, Vygotsky (1978), Werner and Kaplan (1963), and Carpendale and Carpendale (2010) share the view that infants become aware of the social significance of their actions as others respond to them.

To investigate early communicative development, including the earliest signs of intentional communication, Bates et al. (1975) analyzed longitudinal video recordings and diary observations of three infants in their homes. Bates et al. (1975) concluded that pointing first emerges as a non-communicative orienting action towards objects or events of interest, and only later becomes associated with communicative schemes. More specifically, the authors state that "pointing first serves a quite separate cognitive function, and is only incorporated into communicative schemes when those schemes are fully developed and stable," (p. 218) and that the Gestalt notions of "emerging and

distancing can be applied to the gradual ritualization of all imperative and declarative behaviors into an abbreviated repertoire of signals” (p. 218).

Cochet and Vauclair (2010a) recorded spontaneous pointing behaviour in a daycare setting and concluded that infants produced more whole hand pointing in imperative situations and more index finger pointing in declarative contexts. In their recent study, Liszkowski and Tomasello (2011) analyzed 12-month-old infants’ pointing behaviour with their parents during 5-minute sessions of looking at out-of-reach objects together. The authors concluded that index finger pointing likely develops after whole hand pointing and the two are significantly different. Moreover, the authors argue that once infants start pointing with their index fingers extended, their gestures are fully communicative acts.

## Functions of Pointing

In their pioneering paper, Bates et al. (1975) differentiate between *pointing to request* (proto-imperatives), and *pointing to share attention* (proto-declaratives) (p. 208). Research involving children with autism, as well as non-human primates, provides support for the importance of the distinction between these two types of pointing. Among other researchers, Camaioni, Perucchini, Muratori, and Milone (1997) found that children with autism learn to make requests using pointing, but have difficulty with using pointing to direct or share attention. In cases when these children do use referential gestures, these seem to be mainly imitative. Although non-human primates rarely use pointing gestures in the wild, they do use pointing in captivity, but mostly in imperative ways (Leavens & Hopkins, 1999; Gómez, 2007). For example, Gómez (2007) describes an orangutan pointing towards a key that its caretaker needs to open a box containing the ape’s food. Although apes are observed to point in referential ways in some situations, they do not seem to use pointing in ways in which sharing attention or interest is the end goal of their actions.

Building on Bates et al.’s (1975) original description of the two broad functions of proto-imperative and proto-declarative pointing, several additional functions of pointing have been defined and described in the last few decades. Liszkowski, Carpenter,

Striano, and Tomasello (2006) found that in addition to pointing to request and pointing to share attention (Bates et al., 1975), infants also point to inform. More specifically, the authors tested whether infants would point in response to the experimenter searching quietly for a displaced object as well as whether infants would point more towards the object of interest versus a distractor object. They found that infants pointed towards the object the experimenter was searching for, without any sign of wanting the object for themselves. Liszkowski et al. (2006) concluded that, in addition to pointing to request and pointing to share interest or attention, as early as 12 months, infants are able to use pointing to inform others. Tomasello, Carpenter, and Liszkowski (2007) then differentiated between *declarative informative* and *declarative expressive* pointing, based on their argument that these two functions of pointing have different motives. The authors defined declarative expressives as pointing “in which the infant seeks to share an attitude with an adult about a common referent” and declarative informatives as pointing “in which the infant seeks to provide the adult with needed or desirable information ... about some referent” (Tomasello et al., 2007, p. 713).

In their detailed analysis of a mother’s naturalistic diary observations of her son from 6 to 14 months, Carpendale and Carpendale (2010) found that in his familiar home environment, the infant pointed to *share attention* (proto-declaratives), to *make requests* (proto-imperatives), and to *answer questions*. Muneton and Rodrigo (2011), in a longitudinal study, observed four 1-year-olds and four 2-year-olds as they interacted with their mothers at home. Based on their observations, the authors differentiated the proto-declarative functions of pointing *to show* (infant points; adult responds verbally or smiles) and pointing *to inform* (infant points at an object adult is looking for; adult looks at it) as well as the proto-imperative functions of pointing to *request an object* (infant points at an object; adult gives it), *request an action* (infant points at an object which informs the adult what action the infant wants her to do), and *request co-operation* (infant points; adult provides help).

Similar to Muneton and Rodrigo’s (2011) function of pointing to *request an action*, Darwin (1877) described an example of this type of pointing in his writings:

When a little over a year old, he used gestures to explain his wishes; to give a simple instance, he picked up a bit of paper and giving it to me pointed to the fire, as he had often seen and liked to see paper burnt. (p. 189)

Finally, in their experimental study with 16-month-old infants, Begus and Southgate (2012) argue that, instead of pointing to share attention (proto-declarative), infants point *to interrogate* – to obtain information from others. Based on video recordings of infants as they interact with researchers, the authors conclude that infants point more frequently in the company of researchers who they perceive as more knowledgeable. In the authors' words, "infants are motivated to share their interest in objects and events because they want others to provide them with information about these objects and events" (p. 615).

In summary, the following functions of pointing have been defined and described in the pointing literature:

- Proto-declaratives: *pointing to show or share attention or interest, pointing to inform, and pointing to ask questions / interrogate* (e.g., Bates et al., 1975; Begus & Southgate, 2012; Carpendale & Carpendale, 2010; Carpendale & Lewis, 2006; Liszkowski et al., 2006; Muneton & Rodrigo, 2011)
- Proto-imperatives: *pointing to request an object, to request an action, and request co-operation* (e.g., Bates et al., 1975; Carpendale & Carpendale, 2010; Muneton & Rodrigo, 2011)
- Pointing to answer questions (Carpendale & Carpendale, 2010)

## **Chapter 2.**

### **Current Study and Purpose**

Researchers have investigated the development and functions of pointing using a number of different methods, including cross sectional and longitudinal experimental studies (e.g., Liszkowski et al., 2006; Tomasello et al., 2007), video recordings in daycares and homes (e.g., Cochet & Vauclair, 2010a, 2010b; Muneton & Rodrigo, 2011), as well as diary observations in the home (e.g., Carpendale & Carpendale, 2010). However, most recent studies on pointing examine infants' behaviour as they interact with researchers in an artificial environment that is very limited in terms of its resemblance to real social situations (e.g., Begus & Southgate, 2012; Behne, Liszkowski, Carpenter, & Tomasello, 2012; Cochet & Vauclair, 2010a; Cochet & Vauclair, 2010b; Liszkowski et al., 2006; Liszkowski et al., 2007; Liszkowski & Tomasello, 2011). In Martin and Bickhard's (2013) words, experimental studies are "minimally, proximately, and simplistically social" (p. 6), and the authors argue that, instead, people should be studied "within their worldly contexts" (p. 3). Even so, every methodology has its advantages and disadvantages and the results of experimental research on pointing contribute greatly to our understanding of the nature and diversity of early pointing behaviour. Regarding whether it is naturalistic observations or controlled experiments that are more important, Tomasello and Call (2008) acknowledge that "both are necessary, and their functions are complementary" (p. 451).

Diary observations can complement experimental studies because they do not restrict the researcher to specific situations and short time intervals. Longitudinal diaries provide great detail and rich descriptions of the infant's behaviour as infants interact with familiar social partners in their natural environments in which gestures develop. Diary studies allow for the collection of data at closely spaced time intervals, as well as the documentation of important changes in behaviour that might happen infrequently and therefore might not be possible to capture in experimental studies (Altmann, 1974;

Braunwald & Brislin, 1979; Martin & Bateson, 1993). Another advantage of diary studies is that parents can discuss the history of the situation (Braunwald & Brislin, 1979).

Historically, naturalistic diary observations have been an important aspect of studying early development (e.g., Darwin, 1877; Shinn, 1900), and there are a number of studies on pointing which involve some elements of this type of research method. For example, Cochet and Vauclair (2010b) recorded the spontaneous pointing behaviour of 26 toddlers in a daycare, but did so on a predetermined schedule and for short time intervals. Muneton and Rodrigo (2011) recorded the pointing behaviour of 8 infants, five times over a year, as they interacted with their mothers during everyday activities in their homes. Finally, Carpendale and Carpendale (2010) conducted a longitudinal diary study and analyzed parental observations of one infant's communicative behavior, supplemented with observations of another infant. Therefore, I believe that a detailed analysis of longitudinal diary observations of a larger group of infants, starting before pointing emerges, can greatly contribute to current research on the functions and development of pointing. This approach is also in line with Werner and Kaplan's view (1963) that "Only if one compares pointing per se with its precursors and preliminary stages does one get a clear understanding of its continuity with pre-referential activities, as well as its distinctiveness, and emergent character" (p. 78).

## **Early Routines**

Canfield (1995) argues that the child does not learn by simply observing, but "in the first instance, the child naturally takes part in the interaction patterns in question" (p. 197) and the child's experiences within these interaction patterns "underwrite the actions that support language" (p. 198). Infants participate in everyday routines and they learn what their actions mean to others in specific situations (Canfield, 1995). They learn to communicate in their homes through interacting with their close family members. According to Canfield (1995), in addition to participating in everyday routines, another essential component of early interactions between parent and child is the natural tendency of the parent to constantly observe, anticipate, and react to the infant's actions, which then elicits a reaction in the infant, and these are what he calls "proto-language games" (p. 197). In Canfield's (1995) words,



A proto language-game is no language-game; it is a stage that precedes even the simplest symbol use, as it precedes the simplest use of what I shall call natural gestures. The proto language-game stage is easily overlooked, and its importance easily underestimated. (p. 198)

One example of a proto-language game is when the infant reaches to get an object and the parent responds by handing it to him. “These are an example of the basic, ground-level interaction patterns between child and caretaker that support the development of language” (p. 198). “Proto language-games include ... narrowly circumscribed *routines* as well as the more loosely structured pattern of *anticipation and response* that is foundational for children's intention-utterance” (Canfield, 1995, p. 199, italics added).

Building on Canfield’s (1995) view, it is a logical first step to start with a detailed description and analysis of early parent-infant interactions within everyday routines, in the dyad’s natural environment.

The present thesis builds upon Carpendale and Carpendale’s (2010) and Bates et al.’s (1975) studies and involves additional observations of Grey (GC, from Carpendale & Carpendale, 2010), as well as 17 other infants. The purpose of the present study was to create a detailed description of early functions of pointing and investigate how these functions develop, based on Canfield’s (1995) discussion of the importance of early routines and parents’ natural tendency to anticipate and respond to their infants’ projects.

In summary, my goal was to answer the following questions:

1. What are the early functions of pointing that are described in longitudinal parental observations of infants’ early pointing behaviour?
2. How do the different functions of pointing emerge? What role do routines play in the emergence of the functions?
3. At what age do parents first record examples of different functions of pointing?
4. How does infants’ behaviour change over time and across the different functions?

## Method

Participants in the present diary study were 18 infant-parent dyads (four girls) from families living in two large Canadian cities. The gender ratio of the present study resulted from chance. The mothers of 11 infants (four girls) started their observations between birth and 40 weeks and continued until between 14 and 24 months, and this age range captures the time interval of the emergence of pointing. I will refer to these families as Long Observation (LO) families. The diaries of the other seven families (either not longitudinal or not capturing the time interval for the emergence of pointing) provide additional observations that are valuable for the current analysis. I will refer to these families as Short Observation (SO) families. Diary observations were supplemented with video recordings for two of the SO infants. Nine of the eleven LO infants and six of the seven SO infants were firstborn children and all of the infants were living with both parents. Thirteen parents taught baby signs to their infants. Mothers were recruited through a parenting website and word of mouth. Interested parents attended an information session describing the research in more detail. All of the infants were healthy full-term infants.

Mothers were not required to observe according to predefined time sampling periods. Rather, they were asked to record changes in their infants' communicative behaviour as well as provide general descriptions of common ways of communication (*ad libitum* sampling, Altmann, 1974; Braunwald & Brislin, 1979; Martin & Bateson, 1993). More specifically, parents were asked to record examples of early arm and index finger use, vocalizations and gaze direction, and as much detail about the situation (and the history of the situation) as possible (Altmann, 1974). In addition, parents were asked to record other forms of communication and changes in their infant's behavior and communicative skills. This allowed for the recording of rare, but potentially important developments that are noticeable to parents, but difficult to capture in experimental studies (Braunwald & Brislin, 1979). Since parents are an important aspect of the infant's environment in which pointing develops, their descriptions of their own reactions, as well as their interpretations and responses are important and valuable as well.

Parents recorded and provided their observations either in online journals about their children or through email. Their entries were then converted into Word documents. The date was indicated at the beginning of each observation or group of observations. Diaries of different families varied in frequency of observation as well as in how much detail parents included regarding their infant's behavior, their own responses, details of the situation, and details of the history of the situation. Most parents submitted their observations on a regular basis and were available for questions regarding clarification of details or recommendations for what to focus on in subsequent observations. The length of the diaries varied between about 5 to 40 pages. Overall, the raw data included about 250 pages of observations. Before the actual analysis and categorization of observations, all of the diaries were read and relevant observations were highlighted. These included observations involving arm extension and index finger use (including touching with the index finger). About 200 observations (40 pages) from infants aged between 5 and 22 months were selected for further analysis.

The present qualitative analysis included four steps. Observations were first grouped into categories based on parents' responses to, or interpretation of, their infants' pointing. To analyze parental behaviour, parents' engagement with the infant's object of interest were coded. For example, giving an object was coded as an *imperative (request)* response and was differentiated from talking about / labeling / looking at the object, which was coded as a *declarative (sharing attention)* response. *Sub-categories* of the imperative and declarative responses were coded as well, based on previous studies (e.g., Muneton & Rodrigo, 2011). After initial categorization, the infant's behaviour: body, arm, and index finger position, gaze direction, vocalizations (based on Carpendale & Carpendale, 2010; Cochet & Vauclair, 2010a), and persistence (based on Bates et al., 1975) were analyzed. For example, persistent pointing and looking at the parent might mean that the infant's goal might not have been fulfilled. In addition, the fact that the infant is looking at the parent and is persisting indicates that he or she is anticipating the parent's help. On the other hand, infants might point quietly, without looking at the parent, and still receive an object from the parent. In the third step of the analysis, the situation, including the objects involved, was analyzed. Finally, observations were grouped based on the routine they occurred in, to collect information about changes in the infant's behavior within specific everyday routines.

## Chapter 3.

### Analysis of Diary Observations

Parents involve their infants in daily routines; they feed them, go for walks, give them baths, and play with them. The nature of the routines infants are involved in depends on many levels of biological, social, and cultural factors. In the current diary study with infants from families living in large Canadian cities, common routines included feedings, reading books together, bath time, going for walks, playing together, and more generally pointing at and talking about objects and events together. As the infants developed they became more active participants and started to anticipate the steps involved in routines, which seemed to be an important factor in early communicative development. Many infants were eager to point out the steps in familiar routines, as MC does in the following observation:

[Obs. 1] *MC (12 months)* This afternoon when I picked up M from D's (who looks after him several days a week) he pointed out the door, and then he pointed to his red boots that were up on a shelf, then he pointed to the bag of diapers, and then to his black bag with his clothes and bottles, and then he pointed to his coat that was hanging on a door knob. He made a sound each time he pointed. He hadn't forgotten anything.

Overall, the following functions of pointing emerged as a result of my analysis of early pointing behaviour within everyday routines:

- Proto-declaratives: Ask questions / share interest, Share attention by identifying, by commenting, and by referring to past events
- Proto-imperatives: Request an object, Request an action, and Request help
- Answer a question about an object, about a goal, and in response to yes-no questions

This chapter is organized according to the above categories. Most sections begin with the analysis of developmentally earlier examples of the function, followed by examples with more evidence that the infant understands the social significance of her gestures for others; that is, more evidence that the infant expects a response in advance, before the parent responds in any way. Selected everyday routines that were commonly described by parents are discussed under the function they seemed to be most related to.

## Proto-Declaratives

Declarative pointing is most often described as pointing to share or direct attention or share interest. In differentiating *proto-declaratives* from *proto-imperatives*, Bates et al. (1975) state that “The mutual joy taken in such interactions provides the first loop in the construction of declarative communication: the formulation of social interaction as a goal in itself” (p. 213). The fact that infants enjoy interacting with others might be an important, but currently not well explored, aspect of early social development.

All of the parents recorded examples of *declarative pointing* and the first examples were recorded as early as the function of *pointing to request an object* (discussed in the “Proto-Imperatives” section), around 40 weeks. However, as infants got older their pointing behaviour became increasingly varied and they were able to achieve the same outcome in a number of different ways. Pointing at and labeling objects seems to be an important activity in which parents and infants participate together. All of the parents in the present study reported examples of themselves and their infants pointing in situations that involved labeling and talking about objects. One specific routine which involved this type of interaction was the activity of reading books together. Many parents also reported quizzing their infants on their knowledge of words shortly after their infants started to talk.

Canfield (1995) differentiates between specific everyday routines and the more general tendency of parents to anticipate and respond to their infants’ behaviour. Labeling and talking about objects in the infant’s surroundings seems to be a more

general routine that overlaps with many of the more specific everyday routines. For example, parents will engage in this behaviour during walks, playtime, and book reading. They will name and talk about birds, trees, toys, and pictures in books. Parents point to and talk about objects and events they deem to be interesting to their infants and they also respond to their infants' orientation (e.g., based on gaze and bodily direction, reaching, and later pointing) towards objects and events.

## **Early declaratives**

Interestingly, some parents reported labeling and talking in response to whole hand pointing, while others described different responses based on hand shape. In the following observation, IS's whole hand pointing gesture functions as a proto-declarative, or more specifically a question, because her mother responds by talking about and labeling the birds:

[Obs. 2] *IS (37 weeks)* I was walking along the sidewalk with her in the carrier on my front. We passed under some rather noisy crows that were sitting in a tree. She obviously heard them because she looked up, stretched her arm and hand up toward them (open hand, not pointing). I looked up to see what she was looking at and then I said "Do you see the crows? They are birds. Do you see the birds?" She looked back at me and smiled a big smile. It really seemed like she was pleased that I had seen and acknowledged what she had seen. She seemed pleased that she had shared that with me.

IS's joy in having her mother respond is consistent with Bates et al.'s (1975) discussion of the importance of this aspect of early interactions in the development of proto-declarative pointing. In the following observation, NR's father responds similarly to whole hand pointing:

[Obs. 3] *NR (41 weeks)* He now also reaches out to objects. The other day, M was holding N in the kitchen and N reached out his hand toward the light on the ceiling (hand open and fingers stretched out toward the light) and he was staring at the light. M said, "Do you want to see the light?" and he

walked N closer to the light. N still continued to reach toward the light and had his gaze locked on it. M repeated "light" and then N lost interest and looked back at M.

In contrast to IS's and NR's parents, TM's mother does not respond to whole hand pointing, but does respond to index finger pointing by labelling the object:

[Obs. 4] *TM (48 weeks)* Yesterday was the first day that TM clearly pointed to something. I was putting her in her car seat and as she was sitting in it, she pointed up to the light on the ceiling with her forefinger, while the rest of her fist was closed. TM has reached for the light before but this was the first time she actually pointed to it. I noticed that this was the first time I labeled the light for her. Before, when she would just reach for it and I never said to her "Light," I guess I just assumed she was reaching for it, not that she wanted to know what it was. Now just because she pointed, I told her it was a light. Throughout the rest of the day F noticed that she was pointing at a lot more things.

As illustrated by the above observations, parents likely respond differently to their infants' early pointing behaviour, which might result in different developmental pathways for each infant.

In addition to pointing at objects of interest, infants' early pointing behaviour involves pointing directly at people as well:

[Obs. 5] *GC (13 months)* Today he pointed right at S. GC was standing next to the couch and she was across the room, and he had been waving at me to come hold his hand for walking. I hadn't, and then he pointed at S. But it didn't seem like he wanted her to come to walk him - though that might have been okay. It seemed to me that he was just noticing her again, after having been focused on me... He didn't say anything, and he didn't point for long, not even long enough for her to move. S said, "yes, me. I'm here too" or something to that effect, and he stopped and turned around and moved on, then insisted that I come over...

GC's pointing above functions as a declarative gesture and results in initiating interaction with S. GC likely did not point to request S to walk with him because he is capable of expressing his requests clearly at this age; his mother notes at the end of the observation that he kept insisting on getting help from her. Several infants were observed to point at other people directly, many times without any evidence for their pointing having a social purpose.

### **Related routine: Reading books**

Reading books was a common routine among the families in this study and at younger ages it generally involved the parent pointing at, and talking about, the pictures in the book. As infants developed, they gradually learned how to participate and became full partners in pointing to ask, as well as answer, questions about pictures in books. In the earliest observations, infants were observed to engage in tactile exploration using their index fingers during book readings.

[Obs. 6] *IS (32 weeks)* For the first time today I really noticed that she is exploring pictures in books with her index finger. She's really into the touch and feel books at the moment, such as "That's not my puppy" and she likes to feel the different textures. Up until now, she has been using either her thumb or her whole hand to feel things.

In the above observation, IS's mother describes her daughter's behaviour during book reading at the age of 32 weeks, before the emergence of pointing. She describes IS using her index finger to explore pictures in the book, a behaviour that was recorded by many other parents as well. In the following observation, AQ's mother contrasts early index finger exploration with whole hand pointing at distant objects:

[Obs. 7] *AQ (40 weeks)* She now touches EVERYTHING with her index finger. She'll pass it along the pages of a book when I'm reading to her, or touch parts of my face when I'm carrying her. I haven't noticed the index finger pointing out when she's specifically pointing at something in the distance (whereas she does use her arm to do this), but mostly to point at stuff that she can touch.



At this early age, most infants were using their index fingers to touch and explore, while not yet extending it when pointing at objects or events of interest in the distance.

Book reading eventually became a naming game that involved turn taking and different functions of pointing:

[Obs. 8] *TM (16 months)* When we read books TM points at the pages and I tell her what all the things are, and sometimes I ask her where certain things are on the page, such as a bear or doll, or baby and she will point to them.

Some parents talked about their infants imitating others' index finger pointing within the book reading routine:

[Obs. 9] *MC (40 weeks)* About two days ago I was 'reading' MC a book and G came over too. G pointed out the 'light part' of the firefly to me, and immediately MC reached out and touched the same area with his index finger.

In the above observation, MC might be imitating his brother's index finger use and this example illustrates how young infants might respond to others' pointing in specific situations or routines. The following is another example of similar behaviour:

[Obs. 10] *LA (12 months)* This evening when I was reading a book to him I noticed that he held the canonical pointing gesture with his left hand each time that I made the gesture to point to various things on the page. It didn't seem that he was specifically pointing at anything but he was pointing when I pointed as sort of a copying behaviour.

At least two aspects of these early book reading routines seem to be important in the development of pointing, at least in cultures and families in which parents read books to their children. First, infants are naturally interested in aspects of their environment and they will reach towards and touch objects they are interested in, often using their index

fingers. When they engage in this behaviour within the book reading routine, it becomes embedded in a routine of pointing at and talking about pictures. Second, parents will point as well, which infants might imitate or respond to in some other way. Eventually, infants learn to anticipate their parents' responses and reading books develops into a routine that involves turn taking, as infant and parent point to and talk about pictures together.

In the following observation MC is observed to be able to point in response to "where is" questions when reading books with his mother, who expresses her thoughts on what MC's responses might mean.

[Obs. 11] *MC (13 months)* Tonight with the book, for example, I'd say, 'where's the baby?' he'd point (mostly to the baby, but on the page with snow falling he would invariably point to the snow). The pointing to the snow calls into question the responsive nature of the point. Was he pointing because I asked about the baby, or was he pointing to the most compelling illustration (usually the baby, but on one page the snow), regardless of my question? Also, on one page I asked him 'where's the dog?' after we'd found the baby; he passed right over the dog to the face of a mannequin. Does he not know what a dog is? Had he not made the connection between dogs and illustrations of dogs? Was he distracted by the face at the last minute? It kind of comes down to the same question—is his point responsive? Or independent (entirely his own project, he is essentially ignoring me) or perhaps initiative (he wants to talk about faces, not dogs). I responded, 'oh, that's a face, a person's face. This is the dog (pointing to the dog).

MC's mother wonders about whether her son's pointing is responsive or not. Based on the above observation, MC's behavior might be transitional at this point and he might understand the routine of pointing at something in response to "where is" questions (or questions in general) or he might have some understanding of the routine of "pointing at pictures while reading books", without fully understanding the specific function or purpose of his own or his mother's pointing gestures.

In addition to using their index fingers to explore pictures and textures in books, as described in the following section, infants engaged in this behaviour in other situations as well.

### **Index finger exploration and pointing-to-touch**

[Obs. 12] *IS (35 weeks)* She was exploring the toys on top of the shelf with her index finger - something which I haven't really seen much of except when reading books.

[Obs. 13] *IS (36 weeks)* In previous posts I have talked about she extending her index finger to touch toys and images in books, but I haven't seen her do it for things that are further away. Usually, if she sees something she's interested in that is out of reach, she will extend her arm and all of her fingers out toward the object.

[Obs. 14] *IS (36 weeks)* She was cradled in my arms after nursing and she lifted her arm up and "pointed" at my lips. In the past, she has reached up and touched my nose and lips with her finger, but this time she didn't touch.

In the above observations, IS's mother describes different ways in which her daughter uses of her index finger: she explores pictures in books, objects, and her mother's face (also see [Obs. 7]). She also notes that at this age, IS does not yet use her index finger to point at objects further away, rather she uses her extended arm and fingers to do this. In the last observation, at 36 weeks, however, IS's mother notes an interesting change in her index finger use as IS points at her mother's lips instead of touching them as she used to.

Similar to IS's early index finger use, AQ (in [Obs. 7] above) and NR (below) are observed to use their index fingers to explore pictures, objects, and faces:

[Obs. 15] *NR (43 weeks)* My friend A was holding him when he reached out to her face with his right hand with his pointer finger extended and the rest of his fingers closed into a fist. He pressed his pointer finger to her face and

then pulled back. Later that evening, M was in the shower with NR and he used his pointer finger again to push against the glass shower door attempting to "touch" me on the other side of the glass. He did this several times.

Except for routines such as reading books, where index finger exploration is embedded within talking about pictures in the book, parents rarely included their responses to this early index finger use. Based on their descriptions of these situations, it seems that parents tend to interpret this behaviour as tactile exploration, rather than a desire to know or talk about something.

Infants start to reach for objects they are interested in at an early age, around 20 weeks. It is only later, around 35 weeks that they start to use their index fingers to explore objects they can touch and shortly after they start to use index finger pointing towards out-of-reach objects. At this point, their motive still seems to be closely connected to their desire to explore aspects of their environment, and many times they do try to touch the object they are pointing at (pointing-to-touch).

Current findings are consistent with Carpendale and Carpendale's (2010) conclusion that, at least for some infants, communicative pointing originates in their personal directedness towards aspects of their environment, involving early index finger exploration, and pointing-to-touch. In the current study, Al's mother recorded similar observations of her son:

[Obs. 16] *Al (43 weeks)* Al has been using his index finger in many ways lately. He explores with it constantly, any object big or small. He begins his trajectory toward it with his index finger extended and then touches it and may move it around and usually ends by putting it in his mouth but only after a long inspection of it.

At least for some infants, pointing-to-touch seems to be one early index finger use that emerges after index finger exploration and before pointing at referents that are out of reach.

## **“Dat”**

In addition to responding to their infants' pointing, parents also engage in pointing things out for their infants and while doing this, they often say something like “look at that” or “what’s that?”

[Obs. 17] *TM (15 months)* One thing we have noticed is that if she's excited about something she's pointing to, she excitedly says "Dat." She has done this for the past few months, but it wasn't until a little while ago that F commented to me that he thought her first words will be "what's that," that I started realizing, this whole time we would point things out to F and say "what's that," to which she would focus her attention on, even if only for a moment. Maybe she's picking up the word "that" from us but using a modified version.

[Obs. 18] *IS (12 months)* Sometimes, she will point at something and then look at me, vocalize ‘dah’, continue pointing and looking at me again. I usually try to see what she is pointing at and talk about whatever that thing is.

[Obs. 19] *OS (22 months)* OS has recently started saying "this" quite a bit... he will point and say "this" as if asking what something is, or wanting to be able to hold something that he doesn't know the name of yet.

Based on observations such as the ones above, some version of “this” or “that” seems to be among the first word-like utterances that infants learn. Liszkowski and Tomasello (2011) differentiated the sound “da” from other sounds in their study of pointing as well and found that index finger pointing was more often accompanied by the “da” sound than whole hand pointing. All of the infants observed to use the sounds “that” or “this” were living in English speaking families.

## **Imitation**

Before learning to say “this” or “that,” infants might imitate their parents' pointing, but at first without an awareness of the meaning of this act.

[Obs. 20] *AQ (29 weeks)* I've noticed a few times now that as I carry her around the condo, she'll have one arm sticking straight out, and the configuration of her hand is always changing. She tends to stick her index finger up and twist her wrist, which makes it look to me like she's pointing, although I don't think she's gesturing at anything in particular, and she's not looking up at me to try to show me what she's looking at.

According to AQ's mother, her daughter does not seem to be gesturing at anything in particular, but she still raises her arm and sometimes extends her index finger as they are walking. In addition, AQ's mother notes that she does not look at her or try to get her attention in any other way. In this case, AQ might be raising her arm and extended index finger in imitation of her mother's general behaviour of pointing things out for her. In the following observation, AI is observed to imitate his sisters' and other adults' pointing gestures:

[Obs. 21] *AI (40 weeks)* The first time I noticed AI pointing was when we were all sitting around the dinner table and his twin sisters were both pointing and then mom and dad started pointing and AI looked around at all of us and also put his finger out and thumb in and pointed in front of him.

Since then he has pointed quite a lot. He occasionally points and says "ba" very emphatically, maybe because his father has pointed to a ball? However, he does not actually point to a ball and usually looks at his finger when he does this.

In the second part of the observation above, AI is observed to extend his arm and index finger, but looking at his finger, instead of an object. This example of pointing seems to be more of an imitation of the infant's father's pointing, rather than a manifestation of AI's interest in something, or a communicative gesture. Overall, imitation alone does not seem to be enough for infants to learn the social functions of their actions and it is not clear how imitation can lead to, or what role it might play, in the development of communicative pointing.

## Asking questions

Many of the infants' pointing gestures result in their parents labeling and talking about the referent.

[Obs. 22] *TM (49 weeks)* Yesterday while my husband, TM and I were sitting in the living room, she pointed to the reading light I was using to read with and F said "light" and then she turned to him, smiled and then pointed her finger at him so F signed and said "daddy" then she stopped.

In the above observation, TM's father responds by labeling the objects and TM seems to be satisfied with his responses. It is interesting to note that TM points at her father the same way she points at other objects and she gets a similar response, even though pointing at other people this way does not usually have a social purpose.

Overall, it is reasonable to say that TM's gestures function as questions (in this case something like "What is that?"), because that is how her father responds and she seems to be satisfied with this response. These findings are in line with Begus and Southgate's (2012) interrogative function of pointing, but there are important differences between their assumptions and my view of this function. Whereas Begus and Southgate (2012) argue that young infants point to interrogate others, rather than to share interest, in most examples I found no evidence that young infants have an "interrogative motive" (Begus & Southgate, 2012, p. 611). That is, they do not correct their parents' responses and do not persist until their parents label the object (instead of talking about it, looking at it, giving it, etc.). Although infants might expect the specific response of labeling objects in some situations, it is not likely that early pointing has this specific function, *rather than* the more general declarative function of sharing interest or attention, which seems to involve the enjoyment of the interaction as well (Bates et al., 1975).

## Pointing to share attention or interest

As they became more skilled at communicating with others, infants gradually learned to share interest by combining pointing and sounds, words, or baby signs in different ways.

## *Identifying*

At an early age, several weeks before their first birthday, infants started pointing at and labeling objects. Eleven families recorded observations of *pointing-and-identifying* and the earliest of these observations was recorded at the age of 36 weeks.

[Obs. 23] AQ (36 weeks) I think she's trying to say "kitty" and "doggy". When the cat is around, she gets a huge smile (she loves him), does her whole-handed pointing, and says something that sounds like "kikikiki". When Darwin comes by, same point (less smile, but still some), and she says something that sounds like "gu-gu-gu-gu."

[Obs. 24] CP (40 weeks) He would see a dog and make his bark noise at first, then he would point and make his barking noise.

[Obs. 25] AQ (50 weeks) We were staying with friends in Whistler and there was a print that looked like ancient cave art on the wall, which had some sort of hoofed animal in it. Every time AQ saw this print, she'd make her raspberry noise that she associates with horses and point at the painting. At first, I didn't understand why she was doing this noise at the painting, but then I realized that she was looking at these very basic outlines of animals and associating them with horses.

The pointing gestures in the above observations function to identify objects the infants are already familiar with, which are in the infants' visual field at the time of pointing. When infants point-and-identify, their gestures function to inform their parent about their knowledge, even in cases when the infant might not be aware of this. In terms of the social function of these early pointing and labeling behaviours, Bates et al. (1975) noted that

For the very young child (and possibly for the adult as well), the offering of information and the demand for attention are inextricably mixed. Long before he can understand the utilitarian value of sharing information, the child will engage in 'declaring' for primarily social reasons. (p. 209)



In the following observation BF's pointing, combined with words, not only informs his mother of his knowledge of the words, but also elicits confirming responses from her. As noted by Bates et al. (1975), the mutual joy that BF and his mother are experiencing as they interact might be an important aspect of these early interactions as well.

[Obs. 26] In a video recording, BF (17 months) is observed to point at a piece of watermelon while saying his word for watermelon, then pointing at his mother who is holding the camera and saying "mama". In response, his mother says "yes, watermelon... and I am mama". BF looks at his mother many times during the interaction, looks at her when he says "mama" and looks at the watermelon when he says his word for watermelon then back at his mother right after. He is clearly deeply engaged in interacting with his mother and both of them are enjoying identifying objects in the infant's environment.

[Obs. 27] In another video recording at the same age, BF turns and starts to walk away from his mother as he points at his father in the distance and says "dada." He doesn't look at his mother when pointing, but this happens right after interacting with and turning away from his mother, who responds to his pointing with a confirming "dada."

In the observation above, though BF does not look at his mother while pointing, he is likely aware that she is there as he just interacted with her. Nonetheless, even with a lack of evidence that he is trying to communicate, his mother still responds the same way to his pointing.

In the following observation, similar to the observation of TM at 49 weeks [Obs. 22], DF points at his mother directly:

[Obs. 28] *DF (21 months)* We were in our backyard doing some yard work. I had to go to the front to get something and DF got upset. He started to walk towards the front, but only was about half way when he saw me coming back, at which point he said "Mama", pointing at me, but only for a moment and he did not seem to want attention or acknowledgement from

anyone. He pointed at me quickly, then turned around and started walking back to where he came from.

In the above observation, DF's pointing-and-identifying is very quick and does not result in initiating interaction or sharing interest with his mother. It is also interesting that DF points at his mother just the same way as he points at objects and events of interest. From an adult's point of view, pointing directly at someone and stating their names does not usually have a social function, unless it is done in more complex social situations.

In summary, the pointing gestures in the above observations provide information about and / or label objects, therefore they function to inform the parent about the infant's knowledge. However, these gestures also often initiate or maintain interaction with the parent, resulting in *proto-declarative functions* as well.

Although pointing-and-identifying seems to develop within declarative situations and has declarative functions at first, several observations describe older infants pointing-and-identifying *in imperative situations* as well. For example, in the following observation, pointing-and-identifying functions to clarify IS's request for an object:

[Obs. 29] *IS (15 months)* On top of our TV are 3 ornamental toys/figurines—a horse, a clown and a frog. I was sitting on the sofa and IS signed "please". I asked her "What do you want?" and then she pointed up at the figurines. She looked at me and then back to where she was pointing. I got up and picked up the frog and passed it to her. She did not try to take it from me, but continued pointing up at the figurines. She then starting making a clicking sound with her tongue (a noise that she makes when she sees a horse), and I realized that she wanted me to pass her the horse. I gave her the horse and she responded by taking it from me with a smile.

Similarly, Shinn (1900) notes her niece's pointing-and-identifying functioning as a proto-imperative: "She pointed to the woodshed door, with her mewing cry, when she wished to see the kittens" (p. 220).

Overall, pointing-and-identifying seems to emerge within declarative situations as infants and parents point to and talk about objects and events, and read books together. Later this type of pointing seems to be incorporated into other communicative schemes, such as requests, and may function to clarify requests for objects or elicit a routine (*request for action*). For example, in the following observation (similar to [Obs. 29]), LB's pointing-and-identifying functions as a *request for an object*:

[Obs. 30] *LB (16 months)* When we came back home, he pointed at the box where we hold the cheerios saying something incomprehensible that probably meant "cheerios". I gave the box to him and he was happy.

Interestingly, LB's father responded differently in the following observation, even though LB's behaviour seemed to be very similar to his behaviour in [Obs. 30] above, and the context was the same as well.

[Obs. 31] *LB (17 months)* At home he pointed at the cheerios again, saying the word he always says to mean cheerios (incomprehensible to us). He smiled when I said "your cheerios" and pointed to it as well.

Instead of giving him the cheerios, LB's father labeled and talked about them in this case and LB seemed to be satisfied with this response as well. Therefore, in [Obs. 30] above, LB's pointing-and-identifying functioned as a *request* and in [Obs. 31] it functioned *to share attention or interest*.

### **Commenting**

Pointing-and-commenting can be differentiated from pointing-and-identifying, because when commenting the infant points at something and makes a comment in reference to a related object that is not in his or her visual field at the time of pointing.

[Obs. 32] In a video recording, BF (17 months) is observed pointing towards the ocean and making his sound for fish. His mother is filming him and his father is playing with him in the sand on the beach. His mother and father are talking about something else as BF points at the sand in front of him and makes his very quiet sound for fish. At this point, there is no

response from either of his parents. Then he raises his arm and points towards the ocean and makes his fish sound twice more, alternating his gaze from the ocean to his father, to his mother, then back to the ocean, until his father finally says “there are fish there, yes.”

In the above example, BF is clearly trying to communicate and expects a response; he looks at his parents several times and he persists with his pointing until he gets a response.

The following observation is another example of pointing-and-commenting, at a much earlier age:

[Obs. 33] *IS (50 weeks)* J was reading a book with IS and was talking about the birds in the book. She turned away from the book toward the window and pointed outside. J responded with “that’s right, there are birds outside”. She sort of looked back and forth between J and the window.

Pointing-and-commenting seems to be similar to pointing-and-identifying in that both function to call attention to information the infant has about his or her environment, even though the infant might not be aware of this. In the above observation, IS, similar to BF [Obs. 32], looks back and forth between her father and the window she is pointing at, indicating that she is expecting a response. In addition to sharing information, the infants’ pointing gestures function to share attention or interest as well.

### ***Referring to past events***

Three of the infants were observed to point towards a place, person, or object in referring to something that happened earlier. In the example below, IS’s actions of turning towards her parents and talking directly to them provides evidence that she is trying to communicate:

[Obs. 34] *IS (16 months)* Since the incident with the alarm last week, she continues to show signs of being scared or upset about it. Yesterday, we were playing and singing quite contently downstairs in the kitchen, when all of a sudden, her manner changed and she started to “talk” quickly and

frantically about something. It was obviously related to the alarm incident because while she was babbling, she would point up towards upstairs and then do the "scared" sign. She would then turn back towards us and talk directly to us, then look towards the stair, point in that direction, look back at us, and continue to point upstairs.

In the above observation, something seems to remind IS of the alarm incident and this memory becomes the center of her attention. However, instead of pointing quietly, IS is clearly trying to share her experience with her parents. Therefore her pointing could be described as having the function of sharing attention by pointing-and-referring to a past event.

In the following observation, AI uses pointing gestures in referring to a sequence of events that happened earlier:

[Obs. 35] *AI (17 months)* He points with his index up and places it close to his mouth (as if to say now pay attention this is serious!) when he is recounting an event of great significance such as "mama Eden down and booboo" and he will point down where Eden fell and point to his head to indicate where she got hurt all the while looking at her and me at the appropriate time.

A shared knowledge of the event seems to be important for pointing-and-referring to a past event to have a declarative function and share attention or interest.

## **Proto-Imperatives**

The present analysis discusses the following three proto-imperative functions of pointing: *pointing to request an object*, *pointing to request an action*, and *pointing to request help*. Although infants begin to use index finger pointing to *request objects* around 40 weeks of age, all of the infants were skilled at requesting objects earlier than that, before index finger pointing seemed to be incorporated into their requesting

routines. Pointing to request actions and help emerged about 10 weeks later, around 50 weeks of age.

## **Request an object**

Infants started to express interest in objects by trying to reach and grab them shortly after 20 weeks. In the following observations, IS is described reaching and leaning towards toys that she wants. She does not extend her index finger and does not look at her parents or vocalize at this point.

[Obs. 36] *IS (22 weeks)* She is starting to reach for toys and other objects that she wants with an open hand, outstretched arm, and often her whole body leaning forward toward the object.

In the following observation, AQ's behaviour is similar to IS above, but her mother notes frustrated vocalizations as well:

[Obs. 37] *AQ (28 weeks)* She'd watch us eat and make chewing motions with her mouth, sometimes reaching her hands out toward the food. Lately though, she's actually been crying if I don't give her some.

As described in the following observation, by 35 weeks AQ seemed to have learned to simply extend her arm towards objects of interest, likely the result of learning that others will respond to this.

[Obs. 38] *AQ (35 weeks)* AQ is doing a lot more pointing now. Her hand configuration isn't a distinct point, but she is constantly reaching her arm towards things that she wants that are out of her reach. She's not reaching for them, but rather pointing with her arm. She'll shrug her shoulder up under her chin, flop her arm forward and her hand will hang, back up, towards the thing she's gesturing at. Sometimes her index finger will be sticking up above the other fingers, but sometimes not.

AQ's mother also notes that her index finger is sometimes sticking out when she is pointing with her arm, a hand configuration she already notes 8 weeks earlier:

[Obs. 39] *AQ (27 weeks)* When AQ reaches for something (usually one of her balls or the cat), she twists her hand in a way that makes her index finger stick out farther than the rest. At this point, she's not obviously changing the configuration of her fingers, but she is definitely turning her hand to have that index finger pointed farthest out. She's also started to reach (sometimes with the hand-twist) and look up towards me for help. She is still completely stationary... So, when she's sitting playing with her toys, if one is out of reach, she can't get it. She'll flop herself forward to try, but if she still can't reach, she'll often grunt and look to me for help...

At 27 weeks, AQ can already anticipate that her mother will help as she looks towards her while reaching with her arm and hand. She is observed to be reaching with her hand while her index finger is sort of sticking out. Based on her mother's notes and the fact that 8 weeks later she is still not using her index finger to point (based on other diary observations), this hand configuration does not seem to make a difference in her mother's responses, in which case her extended index finger would not become a separate gesture within this context. It is more likely that, at this age, her index finger sticks out as a result of the natural human tendency to hold our hands this way. AQ is first observed to use her index finger around 40 weeks, but only for tactile exploration.

As infants are learning to communicate their requests by gestures such as whole hand pointing, parents tend to interpret their index finger pointing as a request within certain routines as well:

[Obs. 40] *IS (41 weeks)* Yesterday was the first time that I noticed her pointing to communicate that she wanted something. She was in the car seat and eating a cracker and I was sitting next to her in the back. I was talking to my partner and not really watching IS. In the meantime, she had dropped her cracker and it was on my sleeve and when I finally looked, she was just sitting there pointing at the cracker. When I noticed this, I picked up the piece of cracker and handed it back to her. This seemed to make her

happy. While she was pointing in this instance, she wasn't looking at me or trying to get my attention in anyway (i.e. she wasn't making noises or going "uh uh"). She just quietly pointed until I gave it back to her.

IS's mother notes that IS did not try to communicate in any way, by either looking at her or vocalizing. That is, she did not seem to expect a response. She also did not lean or reach for the cracker, resulting in a lack of evidence of her wanting the cracker back. Her pointing still functioned as a request because her mother responded by giving it to her and she stopped pointing after this.

All of the parents recorded observations of their infants during eating and feeding and this routine seemed to be the most common one in which infants' index finger pointing functioned as a request. In other words, parents tend to interpret pointing as a request in these types of situations. For example, NR's pointing and showing of excitement functions as a request in the following observation:

[Obs. 41] *NR (46 weeks)* Also, this weekend we were away at a wedding. We were feeding N and were using pureed food from the jar because it is just easier. We had finished the portion I set up when he started pointing at the jar of baby food, saying "dah, dah, dah" and then waving his arms excitedly. I then gave him more of the baby food and once that was done, he repeated the pointing and excited gestures so I gave him more. It seems he realized that pointing would get him food as well. I may start trying it at other meals to determine if he is still hungry!

NR's mother interprets his pointing as a request (imperative function) in the above observation and NR is very happy with this response. What is interesting is that NR's behaviour seems to be more similar to pointing behaviour that develops within declarative situations where infants and parents look at, label, and talk about objects and events in their environment. Although NR's pointing functions as a request, it is different from more natural, typical early requests that involve leaning, reaching, and whole hand pointing, or the opening and closing of fingers. In the observation below, NR's mother describes him in a similar situation about four months before the previous observation:



[Obs. 42] NR (30 weeks) We started NR on solids a few weeks ago and I've been struggling with trying to figure out if I'm giving him enough. It seems like he would continue to eat if I provided more but he wasn't crying for more. Tonight, I gave him the usual 4 tablespoons. After it was done, I asked him if he wanted more and I used the sign for "more". He looked at me and then opened his mouth with a look of indignation and leaned toward me. I took that to mean he was still hungry! I gave him another teaspoon and asked him again if he wanted more. He once again opened his mouth and leaned toward me. I gave him another teaspoon and he seemed satisfied.

Similar to AQ, NR is first described to use his index finger at 43 weeks, for tactile exploration. He is described to start pointing with an extended arm and index finger around 46 weeks of age, mostly looking at what he is pointing at, but eliciting labeling/describing responses from his parents (proto-declaratives). In other words, at this age, NR's excited pointing generally has a proto-declarative function, yet it functions as a request in [Obs. 41]. This observation illustrates one possible pathway for the emergence of multiple functions of index finger pointing.

As illustrated by the above examples, at least some parents interpret their infants' index finger pointing as a request even in response to varying infant behaviour, including pointing quietly or pointing and vocalizing and/or looking at the parent. Rather than the infant's behaviour only, other factors such as the specific situation or routine, a shared history, and the nature of the objects involved play a role in the function of the pointing gesture as well. These findings highlight the value of diary observations and analyses of parent-infant interactions in the dyad's natural environment.

The following observations include more evidence of the infant expecting a response from the adult.

[Obs. 43] IS (46 weeks) At lunch today she pointed at the empty avocado shell that was sitting on my plate. She was reaching slightly, her body leaning forwards a little; arm and index finger extended fully. She vocalized "nana" (which she seems to say in reference to food in general).

Originally looking in the direction of her point, she shifted her gaze to me, and looked at me expectantly. In response, I looked on my plate and picked up a grape and offered it to her, saying "Do you want this?" She rejected the grape, pushing my hand aside and then looked and pointed at the avocado shell again. When I held it out to her, she took it and she expressed excitement, smiling and waving the avocado shell in her hand.

In the observation above, IS was "reaching slightly, her body leaning forwards a little," providing evidence that she wanted the avocado shell. She also "looked at [her mother] expectantly," which suggests an expectation that her mother will respond. Finally, she was excited and smiled after getting the avocado shell. In other words, it is reasonable to say that she had the goal of getting the avocado shell and she was aware that her mother could help her reach this goal.

Similarly, in the following observation there is more evidence that AQ is now aware of how to get others to help her reach her goal:

[Obs. 44] AQ (12 months) Yesterday, she scooted over to the kitchen, pointed to the crackers on the counter, and signed "more". I gave her one. When she finished, she pointed to the package again, and again, signed "more". I was hesitant to give her another because they're salty crackers, and wanted to find something better for her. In the meantime, she cried out, pointed again, with more force, signed more again. I told her "just a minute, I'm going to find you another snack". To which, she cried again, and, signed the word "eat", then "more" again. This is the first time I've seen her spontaneously ask for food (i.e., I wasn't already getting it out), and the first use of the sign "eat". I didn't even know she'd picked it up, but clearly she'd put the meaning together. I was so impressed that I gave her another cracker (and then found some grapes for her).

AQ, at 12 months, is now able to combine pointing with baby sign language ("more"), which clarifies that she in fact wants some crackers, rather than identifying them or trying to show or share interest about them. Her later cries and repeated signing further confirm her goal of getting and eating crackers. Although AQ's mother does not

mention AQ's gaze direction during their interaction, her sign language and cries indicate that she is trying to communicate. In this case, AQ's persistence is so efficient that her mother changes her mind and gives her another cracker.

Similar to [Obs. 43] and [Obs. 44], CP is very persistent in communicating what he wants and ends up getting his object of interest:

[Obs. 45] *CP (15 months)* CP has probably never seen an ice cream cone, but was particularly interested in J's cone. I offered him a little taste of ice cream on a spoon, but he wouldn't even taste it—he wanted what Daddy was eating. He pointed at it and made a few little squeak noises of interest. I moved my ice cream cone towards him so he could have a taste and he immediately took the cone from me, tried the ice cream and was in heaven.

In all three observations above, it is clear that the infants know what they want, and also know how to get it with the help of others. As illustrated in [Obs. 44] and [Obs. 45], as they get older, they become very skilled at being persistent in reaching their goal.

## **Request an action**

Most parents recorded examples of their infants *pointing to request an action*, which emerged later than *pointing to request objects*. The earliest observations of this function were recorded in situations where the parent and infant were walking together, or were about to go somewhere together, and the parent interpreted the infant's pointing as indication of where the infant wanted to go.

As in requesting objects, parents tend to interpret their infants' pointing gestures as requests for action even when combined with various behaviours:

[Obs. 46] *IS (15 months)* We were walking along the cycle path at Spanish Banks, pushing her in the stroller. We stopped to make sure she was ok. She pointed forwards (in the direction that we were heading), but it was not obvious what she was pointing at. There was nothing out of the ordinary

in sight, no dogs or trees or children. I got the impression that she just wanted us to keep moving, so in this situation, I understood her pointing gesture to mean, "keep going".

At 15 months, IS is very skilled at communicating by pointing, and anticipating her parents to respond. In the above observation, her mother does not describe her gaze direction or vocalizations, but IS does not seem to persist and her mother interprets her pointing as a request for action. In the following observations, two other parents interpret their infants' pointing in similar ways:

[Obs. 47] *NR (51 weeks)* He also uses pointing to direct where he wants to go. As soon as I take him out of his crib in the morning or after a nap, he points at the door to indicate he wants to leave the room. He does this with whomever is holding him. He will point up the stairs if he wants to go upstairs or at the doorway if he wants to leave a room.

[Obs. 48] *LB (17 months)* When we left the daycare, he pointed in front of him saying something that seemed to mean "out".

In all of the above observations parents interpreted their infants' pointing as "I want to go there" or "Take me there." These gestures functioned as requests for action, even though there was no evidence that the infants were aware of the social function of their gestures, i.e., that they expected a specific response in advance.

The next observation provides an example of how infants might learn how pointing can function in different situations:

[Obs. 49] *AQ (12 months)* Although her pointing has been deliberate (i.e., not just pointing at random things of interest) for some time, last night we had a particularly interesting interaction. She was crying very hard. I took her in my arms and she immediately started squirming and leaning towards the crib. I sat down with her because I was worried I'd drop her she was squirming so hard. Her crying settled a little, but she was still upset and trying to catch her breath, and she was still squirmy. Then, she suddenly

stopped squirming and pointed at her crib. Confused, I took her over and laid her down, thinking she was surely going to start screaming again. Her breathing was still irregular from sobbing so hard, but she didn't cry. I gave her her "sleepy sheep", covered her up and walked away. No crying.

AQ is clearly oriented towards her crib yet her mother does not understand what she wants until she points at the crib. Although parents are very good at anticipating their infants' interests and orientation towards aspects of their environment, in this case, based on previous experiences, AQ's mother might have thought it unlikely that AQ would rather be in her crib than in her arms. In this particular case, the difference between the effectiveness of crying and pointing is clear and the different parental responses provide clear feedback to the infant for how pointing can be used in different situations to achieve a desired outcome.

In the following observation, it is clear that AQ had mastered how to communicate her request for actions by pointing:

[Obs. 50] AQ (*12 months*) Today, she was on the foam mat and before even really trying to pick up the piece, she looked at me, made her little "pay attention to me" noise, pointed at the piece and did her version of the sign for help. I came over, removed the piece and went back to the kitchen. She quickly scooted to another piece, pointed at it, and did the sign again, and repeated this until about six pieces were removed, and then moved onto something else.

At 12 months, AQ clearly tries to communicate and get her mother's attention in advance; she looks at her mother and makes "pay attention to me" noises. She then combines pointing with sign language to clarify her request, indicating that she had a clear goal in mind and knew how to use pointing to request an action. Pointing seems to play a clarifying role in her request and it seems to be necessary for AQ's mother to be familiar with their "removing pieces" routine in order to understand what AQ wants.

In the following observation, IS, similar to AQ above, combines pointing and sign language to communicate her request for action. Rather than a clarifying role, her pointing seems to function to initiate a routine IS is familiar with.

[Obs. 51] *IS (14 months)* IS continues to use a combination of pointing and signing to communicate. For example, she will point to the door and then sign "outside" + "please".

A very similar observation from Shinn (1900) is of her niece who pointed "to the garden door, with pleading sounds, when she wished to be taken thither" (p. 220).

The following observation is an example of an older infant pointing out the location of an activity to request an action. ON's pointing gesture functions to initiate a game. However, because it happens right after the game, ON does not need sign language or other ways of clarification to communicate his request to people who have been involved in the game with him.

[Obs. 52] *ON (18 months)* If someone started a game with him on the floor and stopped playing, he would keep pointing to the floor to get the game started again!

In summary, pointing to request an action can be often described as having the function of eliciting a routine the infant is familiar with (e.g., playing a game or going outside). In some cases, parents might interpret their infants pointing out the different steps in a familiar routine as requests for action (e.g., leaving the daycare involves going out), without the infant being aware of this social function.

## **Request help**

Observations of *pointing to request help* are different from *requesting objects and actions*, because, as illustrated by [Obs. 53] below, infants attempt to solve a problem by themselves and when unsuccessful, they stop what they are doing to communicate their request for help. These requests seem to happen in the moment, rather than in relation to a more general routine the adult is familiar with.

[Obs. 53]    *AQ (12 months)* Today I had a hair elastic on my wrist. I was distracted for a minute with the computer while AQ was playing with it on my arm. I noticed that she was getting more and more frustrated trying to get the elastic off of my wrist, then she stopped, looked up at me, pointed at my wrist, and did her sign and noise (sounds like 'doo!' for 'help').

In the following observation, JR can now clearly communicate his requests for help by combining pointing with frustration sounds, while looking at his mother in expecting her help. Similar to the above observation of AQ [Obs. 53], JR tries to solve the problem himself and when he does not succeed, he stops trying and starts pointing and looking towards his mother for help.

[Obs. 54]    *JR (14 months)* He also points when he is frustrated and wants help with something, he was playing with his Fisher Price barn and got a toy stuck in the silo which he couldn't retrieve so he pointed at the stuck toy and made some frustration sounds while looking at me to request my help.

The above observations of infants requesting help from others are similar to Muneton and Rodrigo's (2011) function of requesting co-operation, which they define as "the speaker produces pointing with the intention that the addressee will complete some action in cooperation with him or her, such that they will both achieve a certain goal" (p. 623).

## **Answer a Question**

In contrast to proto-declaratives, where pointing functions to initiate interaction, in the following examples infants point in response to a question or other type of utterance from others. *Pointing to answer a question* was first recorded at the age of 43 weeks, shortly after the first example of *pointing to request an object* at the age of 40 weeks.

## **Related routine: The “Where Is Game”**

Related to talking about and naming objects, most parents described quizzing their infants and playing a “where is game” in which they asked questions to test their infants’ knowledge of objects and expected them to point in response. Interestingly, this expectation is not at all clear to infants and it takes some time for them to learn to point in response.

[Obs. 55] *IS (41 weeks)* Today I was exploring her understanding of certain words and signs. We were on the floor playing and I selected a few toys that I thought she might know the words of and placed them within sight. Then I asked her “Where is the BALL?” accompanied by the sign for ball. She was looking at me and my hands when I said this, and then she started to look around until she eventually directed her gaze toward the ball. She appeared hesitant to actually go for the ball, and looked back at me and then the ball a few times with a look of confusion on her face. It seemed to me that she understood what I was asking her, but wasn’t sure what she was supposed to do next. I tried this with several other toys, with mixed results. If she looked like she wasn’t sure, I would answer my own question and say “Here is the PHONE” or point at the toy and say “there is the ELEPHANT”.

In the above observation, IS’s mother provides a detailed description of her daughter’s uncertainty as well as her own response of modeling the expected behaviour to her. As in the observation above, TM’s mother describes a similar behaviour-response exchange as well:

[Obs. 56] *TM (50 weeks)* I find myself asking her to point to certain people in the room, such as “where’s daddy?” and other things such as body parts, like her nose or her ears. She generally doesn’t point to them but we show her either by directing her finger in the right direction or pointing to it ourselves.



TM's mother also describes her daughter looking at the object in response to her asking where it is. At this point, TM seems to be able to answer the question by "pointing with her eyes", which is how AQ's mother describes her daughter's response to a very similar question:

[Obs. 57]    *AQ (31 weeks)* We do the "where's the kitty?" thing daily, and she gets it right every time. She looks around and finds him, then looks back to me, as though for approval. She doesn't make any hand gestures, but definitely "points" with her eyes.

In contrast to IS's and TM's mother, AQ's mother seems to be satisfied with her daughter's "pointing with the eyes" response. Again, these different parental responses might result in somewhat different developmental pathways in the emergence of the different functions of pointing.

### **Answer a question about an object**

All of the three infants described in the previous section were observed to use pointing to answer questions at older ages:

[Obs. 58]    *IS (12 months)* If we ask her "where is...?" she will more often than not, point in the direction of the thing. Sometimes, she will just shift her gaze toward the object and then smile. In books, she will use her index finger to point to or touch the picture.

[Obs. 59]    *TM (16 months)* When we read books T points at the pages and I tell her what all the things are, and sometimes I ask her where certain things are on the page, such as a bear or doll, or baby and she will point to them.

[Obs. 60]    *AQ (14 months)* If she's got an array of foods on her tray, and I ask "A, where is your orange/cheese/ banana/cracker/ toast/ avocado/ pasta/ chicken...?", she'll search out her food, then point to the correct piece with her index finger.

Werner and Kaplan (1963) present similar observations of two infants learning to respond to questions such as “Where is tick-tock?”

The girl, at 10 months, turned towards the clock and listened; later she turned towards a clock, even when no auditory stimulus could be heard; finally, at 14 months, she pointed to the clock (...) Gunther, up to 11 ½ months, turned towards some of the objects named by his parents, at 12 ½ months, he pointed to them, saying “da.” (p. 79)

Shinn (1900) writes of her baby niece: “She pointed in answer, instead of merely looking, when we asked ‘Where is grandpa?’ ‘Where is Muzhik?’” (p. 220), again noting looking in response, before learning to point.

The developmental trajectory of pointing to answer questions about objects seems to be different from the other functions discussed earlier, which do not seem to require the intentional teaching and showing on the parents’ part. Although the “where is game” was common among families in the present study, it is likely more dependent on cultural and personal habits and customs, when compared to other functions such as requests.

Although in the following observation IS is pointing in response to a question that is similar to the “where is game”, this example is different because it is embedded in a more natural situation of something disappearing out of sight, and here the object IS is pointing at is not in her visual field anymore.

[Obs. 61] *IS (15 months)* IS was playing on the bed with J’s phone. She dropped it down the side of the bed (into the gap between the bed and the wall). J asked her “where’s my phone” and while continuing to look at J, IS pointed in the direction of the gap (so she was looking at J, while pointing in the opposite direction). She then crawled over to the gap and peeked down to look for the phone.

The above observation seems to be more similar to Liszkowski et al.’s (2006) declarative *informative* function, in which the infant points to provide information. The fact that IS is communicating in response to her father’s question is supported by her looking at him while pointing.

One parent noted her daughter's pointing and vocalizing functioning to inform her of a dirty diaper and the need for a diaper change, similar to Liszkowski et al.'s (2006) findings. However, in this case, the infant's pointing did not happen in response to the adult searching for something or clearly needing information:

[Obs. 62] *AQ (16 months)* Half way through the walk, she starts squirming in her carrier, and saying "die-dah". She settled, then started squirming again, repeating the word, after 5 minutes. When we got home, I did a quick peek - looked clean. We went about the routine... 10 minutes later: "die-dah" and bum patting. I peeked again. Looks clean. Weird. I guess she's just pointing out that she knows what a diaper is. But, she just wouldn't stop with this "dia-dah" thing. I kept peeking, and kept seeing nothing. So, at bath time, since I was confident the diaper was only wet, I took it off while she was standing at the tub. Low and behold, out falls a tiny little poop! I guess I hadn't seen it when I was peeking from the back of the diaper. So, she really was telling me that she needed a change.

In addition to pointing to answer questions about objects, infants were also observed to point in response to questions about their goals as well as yes-no questions.

### **Answer a question about a goal**

The following observations illustrate how infants use pointing to answer questions about a goal or intention in two different situations:

[Obs. 63] *AI (14 months)* He also points when I ask where do you want to go?

[Obs. 64] *ON (15 months)* When we bring out a bucket of toys I'll ask where he'd like it put, and he'll point out a spot on the floor for me to set it down.

Although the pointing gestures above are interpreted by parents as answers to questions, observations of this function in the current study are too few and not detailed enough to analyze how and when infants start to use index finger pointing in this way. In the present study, three of the LO infants were observed to point this way and this

function seemed to emerge later than most other functions of pointing, around the same age as pointing-and-commenting and pointing-and-referring to past events.

### **Answer yes-no questions**

Infants were observed to use pointing to answer yes-no questions before they learned more conventional ways of responding to these questions (e.g., nodding or shaking their heads):

[Obs. 65]     *ON (15 months)* When he is sitting in his high chair and I ask if he's "all done" he'll do his usual gesture, and then I'll ask if he wants "down" and he'll point to the floor.

In the above observation, ON points to the floor in response to her mother asking if he wants to get down, therefore his pointing functions as a “yes” response in this case. Pointing in response to yes-no questions was only mentioned in two diaries and, similar to the function of pointing to answer questions about goals, this function seems to emerge later than most early functions of pointing.

Overall, infants were observed to use *pointing to answer questions* within the context of the “where is game”, in response to questions in more natural situations (e.g., about their goals or an object that disappeared), as well as in response to yes-no questions.

## Chapter 4.

### General Discussion

I first discuss the different functions of pointing that emerged from the current analysis, followed by a summary of my findings on the development of pointing. I will focus on the changes in the infants' behaviour over time, as well as the similarities and differences in the development of the different functions of pointing.

### Functions

To answer my first research question on which functions of pointing are recorded in a longitudinal diary study, the observations were first grouped into categories based on parents' responses, then further categorized based on the infant's behaviour. Confirming previous findings, infants' pointing gestures functioned to *ask questions* and *share attention*, to *request objects*, to *request actions*, to *request help (co-operation)*, as well as to *answer questions*. In addition, one infant was observed to combine pointing and vocalizations in a way that *informed* her mother of the infant's dirty diaper [Obs. 62].

*Pointing to share attention (proto-declaratives)* is a function that has been consistently discussed in the pointing literature and parents recorded many examples of this type of pointing in the current study. In order to create a more detailed description of early pointing behaviour, within the broad category of proto-declaratives, I found that infants' pointing gestures functioned as *questions* (e.g. [Obs. 22]) as well as to share attention by *pointing-and-identifying*, *pointing-and-commenting* (e.g. [Obs. 32]), and *pointing-and-referring to past events* (e.g. [Obs. 34]). In addition, in some cases, infants' pointing gestures functioned to share interest when they pointed quietly (e.g. [Obs. 4]). Interestingly, *pointing-and-identifying* sometimes functioned as a *request* as well (e.g., [Obs. 29]). Nine of the eleven LO infants were observed pointing-and-identifying to share

attention and this function was first recorded at 40 weeks. In contrast, only four LO infants were observed pointing-and-commenting, with the earliest example at 50 weeks of age. Finally, three LO infants were observed pointing-and-referring to past events, starting at 15 months.

In line with previous findings, I found many examples of the function of *pointing to request (proto-imperatives)*. Within this broader category, similar to Muneton and Rodrigo's (2011) findings, I found that infants *pointed to request objects, actions, and help*. Although these three imperative functions are usually not differentiated, based on the present diary study, *pointing to request actions and help* seemed to emerge later and were not as frequent as *pointing to request objects*. Analyses of the observations indicate other important differences as well. For example, the function of pointing to *request an action or help* seems to be more dependent on shared routines or the parent being aware of the project the infant needs help with, whereas *pointing to request an object* often involves parents responding to the infants' orientation towards, and desire to obtain, objects in the environment. All of the 11 LO infants were observed pointing to request objects and six were observed requesting actions and help. Interestingly, pointing to *request actions* emerged about 10 weeks after pointing to *request objects*.

In line with Carpendale and Carpendale's (2010) discussion of Grey *pointing to answer a question* about where he was going, a number of parents in the current study reported their infants using pointing this way as well. There were at least three different situations in which infants pointed to answer questions. First, within the "where is game" parents quiz their infants to test their knowledge of *labels for objects*, and infants learn to point in response. Infants also point at absent objects within more natural interactions. Second, they point to answer questions about their *goals*. Finally, infants point in response to *yes/no questions*. The second type of pointing to answer questions about absent objects is very similar to Liszkowski et al.'s (2007) and Muneton and Rodrigo's (2011) category of *pointing to inform*, where infants point in response to an adult searching for an object, but, interestingly, this type of pointing was rarely recorded in the present diary study. Seven LO infants were observed pointing to answer a question about an *object*, the earliest example around 42 weeks. Three LO infants pointed to answer a question about *their goals* and three LO infants pointed in response to *yes/no*

*questions*, both functions emerging later than most other functions, around 60 weeks of age.

Interestingly, the referents of infants' early pointing gestures were not limited to objects and events, but included people as well (see [Obs. 5], [Obs. 22], and [Obs. 28]). Infants were observed to point directly at people in various situations, much the same way as they pointed at objects or events. There seems to be no clear social function of pointing directly at someone the infant is interacting with, therefore these observations are consistent with the view that, at least for some infants, pointing is at first an orienting action towards aspects of the environment including people, rather than a full blown communicative act that is intended *for* other people.

Overall, it was a combination of several factors such as the situation including the nature of the referent (e.g., food or picture in a book), shared routines and history, the parent's personal characteristics, the infant's behaviour, and so on, which together seemed to result in the specific function of each pointing gesture.

## Development

For the second set of research questions relating to the development of the functions of pointing, observations were grouped and analyzed in a developmental sequence within each function. *Everyday routines* that emerged from the analysis of observations were discussed under the function that seemed to be most closely related to the specific routine.

For example, parents tend to interpret their infants' gestures, including index finger pointing, as requests within the *eating/feeding routine*. It is natural for human infants to reach for objects they wish to have, but their mobility is limited for an extended period of time and therefore they rely on others' help. As Canfield (1995) discusses, parents naturally observe, anticipate, and respond to their infants' orientation towards aspects of their environment. Therefore, when parents see their infant reaching, they will often respond by giving the object, but this is not always possible. Although this is the usual response within the eating and feeding routine, in many other situations it is not

possible for the infant to grasp, hold, or eat what she is reaching for, therefore the parent will respond differently. During feeding, reaching usually results in the parent handing the infant the piece of food she is reaching for. Initially, however, this early reaching does not seem to involve index finger pointing. Rather, infants learn to express their requests as their reaching transforms into extending their arms and hands with all fingers outstretched, but without leaning or trying to reach their object of interest. In Vygotsky's (1978) words, who argued that parents' responses to the infant's reaching-to-grasp is where pointing originates from, "from an object-oriented movement it becomes a movement aimed at another person, a means of establishing relations" (p. 56). Although I found no evidence for index finger pointing originating specifically from reaching-to-grasp, infants' early reaching behaviour that involved leaning towards and trying to reach objects without expecting a response, did seem to transform into a stylized gesture of simply extending the arm with an open hand (or opening and closing fingers) and looking at the parent for help, as described by Vygotsky (1978).

At around the same age, between 30 and 40 weeks, infants were observed to start using their index fingers for the *tactile exploration* of pictures and textures in books, as well as other objects and faces – mainly aspects of their environment they could not grasp, take into their mouths, or handle in other ways. Parents did not seem to interpret this index finger exploration as interest and did not usually name or talk about the object. However, infants do use their index fingers to explore books and so in this case their index finger exploration is embedded within the book reading routine, which involves a lot of talking, naming, and pointing by the parent. As parent and infant read a book together, it might seem like they are pointing the same way. However, in Werner and Kaplan's (1963) words, the parent's and infant's gestures might have "material similarity," but perhaps no functional similarity (p. 78). At this young age, the infant is likely using her index finger for tactile exploration, whereas the mother is pointing to identify, for the infant, what she is talking about. The most important difference between their pointing is that the mother's pointing has a communicative, referential purpose, whereas the infant's pointing likely does not have this purpose yet. However, within this routine, the mother likely interprets the infant's index finger use as interest in a picture and will talk about it.



Shortly after the appearance of index finger exploration, some infants started to point with their index fingers at objects with the purpose of touching them (*pointing-to-touch*). In some situations, infants pointed when they previously touched (e.g. [Obs. 14]). These observations are in line with Werner and Kaplan's (1963) discussion of early index finger pointing being helpful for the infant to learn the distinction between himself and other aspects of the world. In other words, pointing has an intrapersonal role in the infant's cognitive development, before becoming a social skill (Carpendale & Carpendale, 2010).

Interestingly, at first most infants were described using their index fingers for tactile exploration only, but at about the same time starting to produce *whole hand pointing* towards out of reach objects with an extended arm and outstretched hand and fingers or all fingers closed. Liszkowski and Tomasello (2011) distinguish this latter type of whole hand pointing from index finger pointing and conclude that "with regard to the morphology of pointing, our results suggest that index-finger pointing is a separate, presumably later development" (p. 27).

My findings of using the index finger for tactile exploration while pointing with the whole hand, and the *combining of schemes*, are also consistent with Shinn's (1900) observations:

First the baby began to use her forefinger tip for specially close investigations; at the same time she had a habit of stretching out her hand towards any object that interested her – by association, no doubt, with touching and seizing movements. Combining these two habits, she began to hold her forefinger separate from the others when she thus threw out her hand towards an interesting object; then, in the second week of the month, she directed this finger alone towards what interested her; and by the third week, the gesture of pointing was fairly in use. (p. 220)

A third factor that is relevant for the development of pointing is infants' involvement in interactions that involve *their parents pointing* at and naming objects. Parents likely start doing this shortly after their babies are born, and from early on infants see their parents pointing and using utterances such as "What's that?" and naming and talking about objects and events. Several infants were observed to point excitedly and say "dat" or "dis." Younger infants were also described to extend their arms and index

fingers randomly in some situations, their parents noting a lack of a clear referent and/or any indication of expecting a response or trying to communicate (e.g., [Obs. 20]). At first infants might raise their arms and extended index fingers in *imitation* after seeing their parents pointing things out for them, without understanding the purpose of this behaviour.

In summary, my results are consistent with Carpendale and Carpendale's (2010) finding that one important precursor of communicative pointing is index finger exploration, which, at least for some infants, transforms into pointing-to-touch, to which parents respond. In the current study, 10 of the 11 LO families recorded observations of index finger exploration. In addition, parents' tendency to point to and talk about objects and events from early on is important as well. Several parents noted their infants imitating pointing as they were observed to look at their own fingers or not look at anything in particular [Obs. 21]. Finally, since infants are born helpless, they are involved in many situations that provide them with opportunities to learn to request objects and actions. The current results are also consistent with Bates et al.'s (1975) findings that infants might combine different schemes in learning to point communicatively for others, and for learning the different social functions of pointing. For example, results of the present study indicate that infants are already skilled at requesting objects when index finger pointing seems to be incorporated into their requesting routines, whereas they seem to have difficulty learning to use index finger pointing to answer questions such as "Where's the ball?" Communicating by pointing seems to originate in specific situations and routines and infants might be using whole hand pointing in one situation, index finger pointing in another situation, and "pointing with their eyes" in a third situation. In addition, specific functions might develop along different pathways for different children, partly because different parents likely respond differently to their infants' actions and early pointing behaviour. Therefore, current results are not consistent with Liszkowski and Tomasello's (2011) argument that once infants point with the index finger, they are aware of the social significance of their gestures.

## Chapter 5.

### Conclusion

The purpose of the current study was to describe early pointing behaviour, including functions and development, by analyzing naturalistic longitudinal diary observations. Recent research on the functions and development of pointing tends to involve infants who have already mastered pointing and are observed in experimental setups. The diary method of the current thesis fits better with views that focus on the interaction of the infant-parent dyad as the origin of social understanding. More specifically, the present thesis aimed to answer the following questions:

1. What are the functions of pointing that can be described in longitudinal parental observations of infants' early pointing behaviour?
2. How do the different functions of pointing develop?
3. At what age do parents first record examples of different functions of pointing?
4. How does the infants' behaviour change over time and across the different functions?

For the first question on the early functions of pointing, results indicate that functions within natural interactions are similar to the functions discussed in previous research on pointing. However, diary observations allowed for a more in depth analysis of early pointing behaviour, resulting in a more detailed description of these early functions. For example, an extended arm and index finger can function as a proto-declarative gesture even when combined with diverse infant behaviours and various combinations of these behaviours, including staying quiet, looking at the adult, looking at the object, *naming the object*, *commenting on the object*, fussing or vocalizing in other ways, and looking towards an object/place *in referring to a past event*. In many examples of early pointing, the function of the pointing gesture seems to emerge from

the combination of several factors, such as the situation or specific *routine*, including the objects involved, cultural customs, personal and shared histories, and other factors.

For the second and third questions on the development of the different functions of pointing, current results indicate that certain *routines* might be more relevant in the development of some functions, but not in the development of others. Different functions also seem to emerge several weeks, and sometimes months, apart, again indicating different *developmental pathways*. The current findings provide no support for Vygotsky's (1978) theory of index finger pointing specifically originating in reaching-to-grasp. Rather, it seems that index finger pointing becomes incorporated into already established requesting routines, indicating that the *combining of different schemes* might be an important step in the development of the different functions of pointing.

In response to my fourth research question, current results are consistent with Bates et al.'s (1975), Carpendale and Carpendale's (2010), and Vygotsky's (1978) view that infants' actions become stylized gestures within interaction, as the infants learn about and start to anticipate others' responses to their actions. Current findings that infants engage in *index finger exploration*, then in *pointing-to-touch*, specifically provides support for Werner and Kaplan's (1963) theory that the earliest function of pointing is its helpfulness for the infant to learn the distinction between himself and other objects in the world, "facilitating the progressive 'distancing' between the child and the object-of-reference" (Bates et al., 1975, p. 218). Parents will respond to *tactile exploration* in some situations, such as the book reading routine and they respond to *pointing-to-touch*. Soon after pointing becomes part of infants' orientation towards other aspects of their environment they cannot touch, such as sounds they hear from outside.

For the current diary observations, parents were instructed to provide detailed descriptions of their infants' behaviour and as much detail about the situation as possible. Although a number of parents included their own responses in their observations, it would be valuable in future research to specifically ask parents to record their own, and other adults', responses and behaviour. This could be achieved with regular video sessions as well, in addition to the observations recorded by the parent. Another recommendation for future research is the creation of experimental studies that

investigate specific aspects of early interaction, building on the current analysis and results. For example, the fact that infants enjoy their interactions with others seems to be an important factor in early communicative development, but this aspect is not well explored. In addition, how the separate developmental schemes such as extending the arm to request an object and exploring with the index finger might be combined to form new communicative schemes could be further explored.

The present research involved Canadian families living in two large cities. Future research could explore the development of pointing in different cultures. This is especially relevant when investigating early pointing behaviour through analyzing everyday routines, which are often culturally specific. For example, in many cultures parents may not read books to their infants or it might not be customary to point things out for their infants and talk about them, or to do this with an extended index finger. For example, in some cultures it is rude to point at a person directly. In other cultures, such as some groups in Papua New Guinea, the index finger does not seem to be used for referential communication at all, rather members of these groups point with their lips (Wilkins, 2003). Whereas pointing with the right hand is widespread, using the left hand this way is unacceptable in some cultures (Wilkins, 2003). Nonetheless, the current results do highlight the importance of early interactions within everyday routines in which parent and infant participate together. In addition, the results provide support for the importance of the natural human tendency of helpless human infants to orient towards aspects of their environment and their parents' tendency to respond to their infants' orienting actions.

Another limitation is that parents tend to observe their infants in different ways; that is, one parent might notice certain aspects of the interaction that other parents might not and vice versa. The advantage of this aspect of diary studies is that parents end up recording details of many different aspects of their infants' behaviour within everyday interactions, contributing valuable information to the creation of a detailed description of early parent-infant interactions in which gestures develop. A third limitation related to the current sample is that most of the participants were first-born infants, living with both of their parents. Infants with siblings likely experience qualitatively as well as quantitatively different interactions with their family members. For example, parents might interact less

with their second or third child, but these infants might receive additional attention from their siblings. In the current study, at least two mothers recorded observations of how older siblings' behaviour and responses might shape their younger siblings' behaviour (e.g., [Obs. 21]).

The purpose of the current study was to describe and analyze early parent-infant interactions in which pointing develops. In contrast to experimental studies involving structured observations in labs for short time intervals, the current study utilized the advantages of diary studies and observations by parents in their homes. Results suggest that exploring and pointing-to-touch with the index finger, as well as whole hand pointing, develop before infants become aware of the social functions of their extended arm and index finger. In addition, results indicate that the different functions of pointing likely develop along different pathways and might involve the combining of different action schemes.

## References

- Altmann, J. (1974). Observational study of behaviour: Sampling methods. *Behavior*, 49(3/ 4), 227-267.
- Bates, E., Camaioni, L., & Volterra, V. (1975). The acquisition of performatives prior to speech. *Merrill Palmer Quarterly*, 21, 205–226.
- Begus, K., & Southgate, V. (2012). Infant pointing serves an interrogative function. *Developmental Science*, 15(5), 611-617.
- Behne, T., Liszkowski, U., Carpenter, M., & Tomasello, M. (2012). Twelve-month-olds' comprehension and production of pointing. *British Journal of Developmental Psychology*, 30, 359-375.
- Braunwald, S.R & Brislin, R.W. (1979). The diary method updated. In Elinor Ochs & Bambi B. Schieffelin (Eds.), *Developmental pragmatics* (pp. 21-42). New York: Academic Press.
- Camaioni, L., Perucchini, P., Muratori, F., Milone, A. (1997). Brief report: A longitudinal examination of the communicative gestures deficit in young children with autism. *Journal of Autism and Developmental Disorders*, 27(6), 715-725.
- Canfield, J. V. (1995). The rudiments of language. *Language & Communication*, 15(3), 195-211.
- Carpendale, J.I.M., & Carpendale, A.B. (2010). The development of pointing: From personal directedness to interpersonal direction. *Human Development*, 53, 110-126.
- Carpendale, J.I.M., & Lewis, C. (2006). *How children develop social understanding*. Oxford: Blackwell.
- Cochet, H., & Vauclair, J. (2010a). Pointing gestures produced by toddlers from 15 to 30 months: Different functions, hand shapes and laterality patterns. *Infant Behavior and Development*, 33, 431-441
- Cochet, H., & Vauclair, J. (2010b). Features of spontaneous pointing gestures in toddlers. *Gesture*, 10 (1), 86-107.

- Colonnesi, C., Stams, G. J. J. M., Koster, I., & Noom, M. J. (2010). The relation between pointing and language development: A meta-analysis. *Developmental Review*, 30, 352-366.
- Darwin, C. (1877). A biographical sketch of an infant. *Mind*, 2, 285-294.
- Gómez, J. C. (2004). *Apes, monkeys, children and the growth of mind*. Cambridge, MA: Harvard University Press.
- Gómez, J. (2007). Pointing behaviours in apes and human infants: A balanced interpretation. *Child Development*, 78 (3), 729-734.
- Leavens, D.A., & Hopkins, W.D. (1999). The whole hand point: The structure and function of pointing from a comparative perspective. *Journal of Comparative Psychology*, 113, 417-425.
- Liszkowski, U., Carpenter, M., Striano, T., & Tomasello, M. (2006). 12- and 18-month-olds point to provide information for others. *Journal of Cognition and Development*, 7 (2), 173-187.
- Liszkowski, U., Carpenter, M., & Tomasello, M. (2007). Pointing out new news, old news, and absent referents at 12 months of age. *Developmental Science*, 10(2), F1-F7.
- Liszkowski, U., & Tomasello, M. (2011). Individual differences in social, cognitive, and morphological aspects of infant pointing. *Cognitive Development*, 26, 16-29.
- Martin, P.C. & Bateson, P. (1993). *Measuring behaviour: An introductory guide* (2<sup>nd</sup> ed.). Cambridge: Cambridge University Press.
- Martin, J. & Bickhard, M. H. (2013). Introducing persons and the psychology of personhood. In J. Martin & M. Bickhard (Eds.) *The Psychology of Personhood: Philosophical, historical, social-developmental and narrative perspectives* (1-16). Cambridge: Cambridge University Press.
- Muneton, M. A. & Rodrigo, M. J. (2011). Functions of the pointing gesture in mothers and their 12 to 36-month-old children during everyday activities. *The Spanish Journal of Psychology*, 14 (2), 619-629.
- Shinn, M.W. (1900). *The biography of a baby*. Boston: Houghton Mifflin Company.
- Tomasello, M. & Call, J. (2008). Assessing the validity of ape-human comparisons: A reply to Boesch (2007). *Journal of Comparative Psychology*, 122(4), 449-452.
- Tomasello, M., Carpenter, M., & Liszkowski, U. (2007). A new look at infant pointing. *Child Development*, 78(3), 705-722.



Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Werner, H., & Kaplan, B. (1963). *Symbol formation*. New York: Wiley.

Wilkins, D. (2003). Why pointing with the index finger is not a universal (in sociocultural and semiotic terms). In S. Kita (Ed.), *Pointing: Where language, culture, and cognition meet* (pp. 171–215). Mahwah: Erlbaum