The development of prosocial behaviour in infants: The role of participating with, problem solving for, and requesting help from caregivers in the first year of life

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Plain Language Statement

Babies and toddlers are known to help others in the second year of life, by doing simple things like picking up dropped toys. However, researchers now believe helping develops earlier, in the first year of life. After reviewing what is known about early helping, my thesis examined how babies begin to help others by first helping their mothers (Study 1), and, for the first time, babies' requests for help from others, and how their requests are related to their other helping experiences (Study 2). The two studies presented here look at how babies interact with their caregivers, naturalistically and in structured game-like activities, from the time that they are five months old until they are ten months old. Study 1 used video-chat with 40 babies and their mothers to see the connection between how mothers and their babies completed activities together naturalistically, and how babies performed in simple helping games, as well as how babies' helping in these activities changed over time. This study found that mothers used gestures and phrases with their babies that were like the ones used by researchers in experiments, that younger babies were more likely to help their moms in cooperation type activities than in problem solving type activities, and that babies were more likely to help in problem solving type activities when they were older. Study 2 looked at 34 different pairs of babies and mothers to identify how babies and their caregivers ask for help from each other. This study found that babies ask for help from their mothers and use similar types of communication as their mothers. This research gave information to help us understand babies' helping and how it develops through both mother-child interactions and babies' own actions. This research is new and gives exciting new information to other researchers that are interested in learning about how babies help others and how they ask for help from a very young age.

Keywords: Prosocial behaviour, infant development, social development, parent-child interaction

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"Now to Him who is able to do far more abundantly than all we ask or think according to the power at work within us, to Him be glory in the church and in Christ Jesus throughout all generations, forever and ever. Amen." Ephesians 3:20-21

To my Lord and Saviour Jesus Christ, thank you for humbling yourself by becoming obedient to the point of death on a cross in order to make a way for every person to be saved by faith in you alone. Thank you for saving me, leading me, growing me, and making me more like You. Use this work for Your glory and thank You for using it for my good.

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Preface

This dissertation stems from and culminates my many years of research in the field of moral development that began before and continued throughout my doctoral studies. I have had the privilege of working with Dr. Stuart Hammond since 2015 when I conducted my undergraduate honours thesis work. Together, we developed a retrospective study of the emergence of prosocial behaviours collected from mothers' recollections of infants' earliest moments of helping. Elements of this work have been presented at the Jean Piaget Society Meeting (2016), Association for Moral Education (2016), and the Society for Research in Child Development (2017). We were also the first to present evidence for the emergence of prosocial behaviours in infants, earlier in the first year of life, in a naturalistic setting (see Hammond, Al-Jbouri, Edwards, & Feltham, 2017).

Out of this initial work I developed a second longitudinal study to observe prospective evidence for earlier emerging prosocial behaviours in infants from 3-months of age to 24 months of age. This work began in 2017 and took a novel approach (at the time), to studying naturalistic behaviour in the home; Namely, through telemetric observation using web technology to observe and record live interactions of mothers and their infants in the home. At the time, I was one of only a few researchers to use modern technology to observe naturalistic interactions (i.e., Dahl, 2015). With the help of Dr. Hammond, I researched and developed a piecemeal system to connect virtually to mothers and infants in their homes (i.e., Skype, FaceTime, Google Hangouts), and used open-sourced programs to record the video and sounds from these interactions (i.e., Soundflower, Blackhole). Although these systems have been largely simplified and advanced in recent years due to the COVID-19 pandemic (i.e., Zoom), I was among the first to apply this type of technology to naturalistic research. Elements of this longitudinal work have

been presented at the International of Congress in Infant Studies (2018) and the Society for Research in Child Development (2019; 2020). Parts of this work are also in the process of being published to share observations about the development of prosocial behaviour in infant self-care contexts.

This larger, prospective study became the backbone of the work presented here (see Study 1) and served to identify a key timeframe for the emergence of infants' prosocial behaviours between 5-10 months of age. It is out of my contributions to these previous works and experiences in the field of moral development that the studies presented in this dissertation have been developed. It is my hope that the works presented here continue to forge a path for the field to consider early prosocial development in an infant's naturalistic environment, and that as a whole, moral development researchers consider novel ways to observe and understand prosocial behaviour. We have much to gain from continuing to expand our approach to moral development, and I hope the presented work inspires us to explore beyond what we already know and to take new perspectives of what we already do.

Chapter 1: General Introduction

The development of prosocial behaviour in infants: The role of participating with, problem solving for, and requesting help from caregivers in the first year of life

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Prominent moral development researchers Lapsley and Carlo (2014) identified early infancy as the next horizon for research on morality and prosocial behaviour. This developmental period is thought to best reveal whether human nature is itself *moral*, as it is also a period where the interplay between biology and socialization is especially evident. In psychology, the study of morality is further differentiated into research on *moral judgement* and *prosocial behaviour*. Although research about thinking and reasoning about moral actions and research about actions that help others are connected, the research programs and traditions studying these developments are somewhat distinct, particularly in the period of infancy. Given that young infants cannot speak research on moral judgments has explored infants' judgments *indirectly*, using looking and reaching preferences to infer their moral knowledge (e.g., Hamlin & Wynn, 2011; Hamlin et al., 2007). In contrast, research on prosocial behaviour has examined infants' behaviour *directly*, i.e., examining what infants do to help others (e.g., Warneken & Tomasello, 2006). Until very recently, and as this thesis explores, a further distinction in the moral development and prosocial behaviour research programs is the age of infants studied. Using looking time and reaching paradigms, researchers have examined the moral judgments of infants as young as 3 months of age. In contrast, research on prosocial behaviour has typically studied infants around 14 months of age who can walk and interact with the world (e.g., Warneken & Tomasello, 2007).

One reason that research on prosocial behaviour has studied infants who can walk and are free to use their hands is that this research examines infants' *problem solving*, namely whether and how infants can intervene to assist someone who cannot complete a task or is otherwise incapacitated (e.g., open a door for someone whose hands are full or retrieve a dropped object).

In adults, problem solving is important because it represents a class of actions that include heroism (e.g., saving someone from a fire), and can also arise in more mundane scenarios (from time to time in everyday life, we do encounter people who need help with a door). However, developmentally the rarity of infants encountering and solving adults' problems outside of staged experimental scenarios has led to questions about how infants learn to help others (Hammond & Drummond, 2019; Warneken & Tomasello, 2006; Zahn Waxler et al., 1992). If an act is very infrequent, it is more difficult to see how it can be socialized and contributes to the idea that prosocial behaviour is innately understood.

Other researchers have examined a broader definition of helping as a form of *participation* where the infant is working alongside a caregiver. Participation is important because it represents a mundane form of prosocial behaviour, and one that could develop with a great deal of social interaction (e.g., helping a parent garden; Dahl, 2015). Pushing the idea of participatory helping even further, infants who cannot yet engage in locomotion could participate helpfully in tasks directed towards the infants' own body by the parent (e.g., stretching their body when getting dressed or holding the breast when feeding; Reddy et al., 2013). As an undergraduate researcher in the Ottawa Social Moral Development Lab, I was involved in the first research project to explore this possibility (Hammond et al., 2017). This study asked parents to recall when their infants and toddlers did something helpful. A small number of parents recalled instances very early in life, before eight months of age. A subsequent research project in this lab has looked to explore parents' perception of infants' helping *prospectively*, following infants from three to 12 months of age. When asked to reflect on infants' helping in this way, most parents report that infants help by 5 months of age.

The research described in Study 1 builds off of this larger prospective study, examining how infants aged five to ten months of age begin to participate in prosocial behaviours, begin to problem solve, and the developmental connections between these two forms of help in the naturalistic environment of the home. Study 2 pushes further ahead to explore infants' problem solving with their mothers; How infants begin to *solicit* help from others, i.e., what infants do when they encounter a problem and need help, and the relationship between mothers' and infants' behaviours to elicit problem solving from one another in the home. To provide a theoretical foundation for this work, the following is provided as an introduction to the available definitions, debates, and literature related to the development of prosocial behaviours in infancy. This review will highlight the need for research to consider prosocial development early in the first year of infancy. Following this review, two research studies are presented, with the chief aim of filling this gap in the literature for the first time.

General Introduction

What is Prosocial Behaviour?

Prosocial behaviour has traditionally been defined as voluntary behaviours or acts that are engaged in for the benefit of another person (e.g., Drummond, et al., 2015; Jensen, et al., 2014). In adults, prosocial behaviours are most often studied in contexts of bystander interventions (such as helping someone who has fallen down), expressions of empathy, or the sharing of monetary resources. Research in young children has explored similar categories of behaviour (Dunfield et al., 2011; Svetlova et al., 2010), and studies of infant prosocial behaviour typically include *instrumental helping* (i.e., helping another complete a goal), *empathy* or *comforting* (i.e., comforting another person), and *sharing* (e.g., of a toy).

What is Problem Solving?

Problem solving is one category of prosocial behaviour that is used to understand independent interventions people engage in to help an otherwise unable person. Problem solving is considered an important moral behaviour in adults, and can be observed in acts of heroism, or in simple activities of daily life, like holding a door open for someone else. In many cultures, these types of behaviours are encouraged in children, and thus, have become the focus of infant prosocial behaviour research, particularly in instrumental helping. One challenge with problem solving in infancy is that research in problem solving often rests on an infant's ability to locomote (Libertus & Violi, 2016). To address this challenge, prosocial behaviour researchers have begun to consider the role of *participation* in infant prosocial behaviour.

What is Participation?

Participation occurs when infants engage in activities alongside others to achieve a goal. In infancy, this often looks like facilitating self-care tasks (i.e., bathing, dressing, feeding), or engaging in other tasks around the home (i.e., cleaning up, cooking) with able-bodied others. Currently, it is well known that prosocial behaviours categorized by problem solving are present by the end of the second year of life (Waugh & Brownell, 2017), but emerging research is exploring prosocial behaviour characterized by problem solving and participation even earlier in the lifespan (Hammond et al., 2017; Köster & Kärtner, 2019).

Participation and Problem Solving in Infancy

The delineation of the differences between participation and problem solving is clearer in older children and adults where actions can be completed independently, and mental processes expressed verbally. In infants, the conceptual distinction between participation and problem solving is muddied because they are simply not able to act independently or explain their actions to others. This is perhaps the hallmark of much of infant research that must be overcome by

developmental researchers (see for example, Rheingold, 1982). Researchers must describe what infants are doing and attempt to understand why they are doing it.

Beyond using research methods to establish conceptual differences in participation and problem solving, researchers have proposed that for infants, problem solving may actually be a special case of participation (Hammond, 2014; Hammond & Drummond, 2019; see also discussion in Reddy, 2008). Infants have frequent opportunities to participate in their everyday life (i.e., diaper changing, feeding, dressing), and so participation can be considered to be the "status quo" of infant-mother relationships in everyday life. Hammond and colleagues (2019) thus propose that in the naturalistic environment of the home infants and their caregivers experience break downs in their everyday participation that require problem solving to repair. Congruent with this approach to understanding participation and problem solving, the present work provides evidence that perhaps infants' participation and problem solving are not mutually exclusive (study 1), and that infants may transfer their participation skills to the special case of problem solving (study 2).

Emergence of Prosociality

Presently, the emergence of prosocial behaviours in the first year of life is not well understood in the literature (Dahl, 2015; Dahl, 2018; Köster & Kärtner, 2019; Paulus, 2014). What is commonly debated in the moral development literature is whether the emergence of these behaviours in infancy is a result of nature or nurture. Influential researchers in the field are divided in their understanding of the mechanisms related to the emergence of prosocial behaviours, with some arguing that babies are born with an innate ability, or moral sense, to engage prosocially (see Hamlin, 2013; Warneken & Tomasello, 2006), while others suggest that prosocial behaviours are learned through social experiences (Brownell, 2016; Dahl, 2015;

Rheingold, 1982; Rogoff, 2003), and yet others argue for a coaction of biological, psychological, and social processes (Allen & Bickhard, 2013; Carpendale et al., 2021; Dahl et al., 2021). However, there are no known longitudinal studies that have followed infants in the first year of life to observe the development of prosocial behaviour.

Nativists propose that all humans are born with the propensity to act prosocially and that these behaviours are not initially influenced by socialization, although later developments may be socialized (Tomasello & Vaish, 2013; Warneken & Tomasello, 2013). It is often understood that for something to be considered innate, it develops early, the infant has a lack of relevant experience with the behaviour (i.e., so it cannot have been learned), and that there is some evolutionary value for the infant to engage in the behaviour (Dahl et al., 2021). Some believe these invariant behaviours emerge spontaneously, beginning with newborns' ability to respond empathetically to the suffering of others (Hamlin, 2013). These early empathic behaviours are also observed in primates, humans' closest relatives, supporting an evolutionary explanation for the emergence of prosocial behaviour (2013). For evolutionary oriented developmental researchers, this evolutionary framework poses two challenges for the study of prosocial behaviour development in infancy. Firstly, because the innate behaviours of interest in evolutionary oriented prosocial development research are those that adults also display (e.g., bystander intervention), this strand of research has focused on infants who can locomote (e.g., can move across a room to assist someone). This explains why the current widely accepted floor of prosocial behaviour is at about 14 months of age. However, as noted earlier, infants seem to be able to help parents before this age. A second related challenge is that instances where infants encounter adults in distress, and are expected to solve the adult's problem, are thought to be rare, which is taken to mean that there are few opportunities for socialization. This gives rise to a

"poverty of the stimulus" situation, that evolutionary developmental researchers accept as further support for the notion that it is not possible for infants to have learned prosocial behaviours because they have not been previously exposed to them (e.g., Warneken & Tomasello, 2006). However, as described below, it is possible that infants are exposed to opportunities to help adults in other types of problem-solving situations (i.e., in self-care tasks). Despite these challenges, some nativists argue that since there are no previous opportunities for infants to learn these behaviours socially, the most basic cognitive concepts associated with these behaviours must *already exist* within the infant, and it is upon these innate cognitive concepts that infants generate hypotheses and behaviours to deal with moral situations (Allen & Bickhard, 2013).

In contrast to this notion of an unchangeable, innate, moral core, some researchers argue that the moral judgements observed in nativist experiments suggest that though infants do have the capacity to care for others early in the first year of life, this caring nature may have already been influenced by very early socialization (Deneault & Hammond, 2021). Further, these researchers argue that the transition from passively participating prosocially to actively problem solving has not previously been considered, and that it is possible that socialization may facilitate this transition as infants grow. For example, through socialization in their naturalistic environment, infants can learn to increasingly act prosocially by observing others, to build on innate morality (if any), and develop new moral understanding (Deneault & Hammond, 2021). Further, Rogoff (2014) suggests that children learn how to engage in social activities and tasks by observing and engaging in tasks with their family and community, thus facilitating the notion that helping emerges within the social context around the child (Dahl, 2018). Recent research on infant prosocial behaviour has examined how infants assist parents in everyday and mundane

tasks, which are common and provide many opportunities for socialization (e.g., Hammond & Brownell, 2018).

Interestingly, what nativists and empiricists both agree on is foundationalism. Allen and Bickhard (2013) describe foundationalism as "the assumption that knowledge is built up from a representational base" (p. 97). This assumption, shared by both nativists and empiricists, states that the nature of moral knowledge is based in information processing and does not grow from an interaction of biological, psychological, and social processes (i.e., action-based systems). Although empiricists and nativists accept that there is a foundational knowledge base, they differ in their perspectives on where this base knowledge originates. It is out of these differing beliefs about the knowledge base that nativist and empiricist approaches to research emerge. Where nativists may overlook the need to determine origin because the assumption of innateness presupposes that the knowledge base has always existed in its entirety, empiricists consider how learning expounds on the knowledge base in both domain and content.

Tackling these foundationalist assumptions head-on, a third constructivist orientation, rooted in Piagetian theory, considers the interaction of biological, psychological, and social processes by taking an action-based systems approach as a means of moving beyond the nature-nurture debate. This orientation does not rely on assumptions related to a passive representational base of knowledge and so this approach allows researchers to overcome research constraints based on this assumption and frees them to consider how representation may emerge out of the interaction of systems within and without the organism (Allen and Bickhard, 2013; Sokol et al., 2015)

Dahl and colleagues (2021) also describe this third approach and suggest that although an empirical debate exists between nativist and empiricist contributions to moral development, a

parallel, paradigmatic debate exists that question whether these two areas of empirical evidence can be separated meaningfully. This third approach, sometimes known as *constructivism,* is an action-based process-relational view that rests on biopsychosocial evidence substantiating the coaction of biological, psychological, and social processes on moral development (Allen & Bickhard, 2013; Carpendale et al., 2021; Dahl et al., 2021). Unlike nativists and empiricists that isolate these processes, researchers that support this third approach tend to adopt a social-interactional view that states that through specific social situations infants learn to help as they receive external cues including requests and praise, and by actively participating in activities that require prosocial behaviour (e.g., helping; Dahl, 2015) to achieve a common goal.

Implications of Theory on Observation

Evidently, how researchers conceptualise the origins and development of moral behaviour influences how it is studied and interpreted in experimental literature. Recently, developmental psychologists have engaged in thoughtful discussions about the strengths and limitations of various theory-driven methods and interpretations of infant moral research (Allen et al., 2013; Carpendale et al., 2021; Dahl et al., 2021). Each argues that assumptions made theoretically significantly affect the way research findings are interpreted and presented.

In Allen and Bickhard's (2013) work, they describe several constraints of nativistic approaches to infant moral development research including the popular dichotomous interpretation of infant behaviour based on looking-time methods. These looking methods have been used to understand infants' moral judgements by asserting that if an infant spends more time looking at a figure acting in a "fair" or morally "right" way, they *understand* that this character is behaving prosocially, and that the infants *prefer* figures that behave prosocially (Hamlin, Wynn & Bloom, 2011). In this example, it is easy to see how theory impacts

interpretation: Where nativistic theory interprets infants' prolonged gazes as indications of infants' preference and moral understanding of a situation, other orientations may understand infants' behaviour as merely a recognition of a difference, rather than ascribing moralistic understanding and preference (Allen & Bickhard, 2013). Applications of nativist interpretations of infant-based moral research are then applied to understand the moral behaviours of adults in very different, real-world situations (I argue that experimental paradigms, regardless of theoretical underpinnings, should mirror everyday interactions infants have within their naturalistic environment for more appropriate extrapolation to real-world situations).

Likewise, empiricists also accept broad theoretical assumptions that constrain interpretations of moral development research. Empiricists understand that infants belong to a social context, and that prosocial behaviours are learned through their experiences in a social environment (Rogoff, 2014). Typically, researchers from this theoretical perspective look to determine if prosocial behaviours observed in adults are present in infants. The limitation here is that some behaviour observed in adults cannot be observed in infants because of physical development limitations rather than a possible moral deficit (Libertus & Violi, 2016). Therefore, empiricists may accept that because a behavioural response from an infant does not mirror that of an adult, the response is not morally informed. (I will argue that young infants' behavioural responses to moral situations may become more like adults' behaviours as they develop and may be dependent on the context of the moral situation).

As discussed, there are drawbacks to each of these approaches to understanding the development of moral behaviours in infancy research, namely that they each require exclusivity of their stances, with little (or no) room for coexistence, or perhaps an amalgamation of theoretical interpretations for research findings. Despite their flaws each of these theoretical

views indicates that there is strong evidence that infants can and do engage prosocially with others. All of these areas of research find that infants have the capacity to participate and problem solve with others, whether this ability emerges innately, is learned from others, or emerges as an interaction of both of these factors. What is important to consider, and is explored in this present research, is that most of these findings have been found only in laboratory settings, where infants are expected to perform actions like those of adults. It is possible that the observation of early prosocial behaviour in an infant's natural environment may allow researchers to observe even earlier occurring demonstrations of infant participation and problem solving that might look quite different than actions adults might use in the same problem-solving situation. Therefore, regardless of researchers' theoretical perspectives, it is imperative that researchers consider how these behaviours begin to emerge so that the understanding of the genesis of these behaviours can be described for the first time, and so that evidence can be provided to establish whether a "poverty of the stimulus" truly exists.

The Role of Individual Development in Prosocial Behaviour

Pushing aside the debate about whether the origins of morality are innate or learned or some combination of the two, it is clear that infants' *behaviour*, whether motor, linguistic, or prosocial, develops over the first year of life. Researchers in some of these domains of infant development have explored the relationships between infant physical development and development in other key areas. For example, the relationship between motor development and early language development has been widely studied, with many studies specifically identifying a relationship between the emergence of walking and language acquisition (Libertus & Violi, 2016; Oudenoeg-Pez et al., 2012; Walle & Campos, 2014).

Unlike in these other areas (e.g., language), there have been few studies of infants' early prosocial development because of the dominance of the conceptual aspects of the problem-solving approach to prosocial behaviour, where there is an assumption that problem solving is not something that is part of the ecology of young infants' daily lives (Dahl, 2017). Research that has observed prosocial development has typically relied on the emergence of walking because this physical milestone enables infants to engage with their environments in ways that emulate those of adults (Walle, 2016). Despite this bias towards researching prosocial behaviour with the emergence of walking, problem solving can be examined earlier in the lifespan.

One way to explore problem solving a little earlier in the lifespan is to have the problem occur more or less in the infants' lap (e.g., dropping an object there or just in front of the infant) so that independent locomotion is not required to solve the problem (Köstner & Kärtner, 2019). This view has previously been employed in other areas of developmental research. For example, one study considered the relationship between language acquisition and motor skills that develop before walking, like sitting and reaching, which typically emerge in infants as young as three months of age (Libertus & Violi, 2016).

The participatory approach to prosocial behaviour would predict that there is participation in shared tasks, initially almost entirely led by the parent, from birth onward. Hammond et al. (2017) found in their study on infant prosocial behaviours in the first two years of life that caregivers reported that infants as young as eight months of age have demonstrated helpfulness, in the form of participatory, coordinated actions with caregivers, in everyday tasks like feeding, bathing, or dressing. Therefore, it is likely that as infants develop motor control in early infancy, their ability to interact with and act on the world around them improves, and instances of primitive prosocial behaviour may begin to be seen more clearly.

Observing Prosociality in Infancy

The available research literature suggests that as infants develop, they are increasingly able to engage in prosocial behaviours before the second year of life, and that this behaviour appears in social interactions with parents. That said, little is known about these behaviours earlier in the first year of life, and how these behaviours may be developing in typical everyday participation opportunities and problem-solving situations in the home.

In a laboratory setting, prosocial behaviour in infants is typically tested through infants' participation in structured situations in which an otherwise able experimenter pretends to require assistance to achieve a thwarted goal (i.e., a task structured around instrumental helping). This research method is exemplified in a seminal study by Warneken and Tomasello (2006), which gave infants (and chimpanzees) the opportunity to assist an adult researcher with a variety of tasks where the researcher was unable to complete their goal, (e.g., opening a door for an experimenter whose hands were full, or retrieving a dropped and out-of-reach object). These laboratory-based studies provide evidence for the emergence of prosociality in infants as young as 14 months (Warneken & Tomasello, 2007). However, as they rely on situations that rarely occur in daily life (i.e., a child helping an adult), researchers have argued that helping is not socialized, as children are "too young to have received much verbal encouragement for helping from parents" (Warneken & Tomasello, 2006, p. 1302).

Some researchers have argued that these laboratory situations reveal only a small part of the story of infant helping, because they involve contexts that are not typically experienced by infants, both in adults being unable to solve a problem, and with the infant interacting with an experimenter, rather than family members (e.g., Dahl, 2017). These researchers have advocated that examining naturally occurring situations in an infants' home may also elicit prosocial

behaviour (Dahl, 2015). For example, in a diary study, parents observed instances of sharing in infants as young as 7.5 months of age in the home (Carpendale et al., 2021). Other home-based studies have also considered activities that are a part of an infant's everyday life (e.g. bathing, feeding, dressing, brushing teeth), observing or interviewing parents about whether their infant interacts with caregivers in a helpful or unhelpful way (e.g. pushing an arm through a sleeve while dressing or keeping their mouth open while brushing teeth; Hammond & Brownell, 2018; Hammond et al., 2017; Waugh & Brownell, 2017) to achieve the goal at hand (i.e. getting the infant dressed, having teeth cleaned by brushing). Research examining prosocial behaviour that occurs in infants' natural environments have found that infants regularly help parents, but do so collaboratively, not just when parents are unable to complete a task, and that this help is often solicited by parents (Dahl, 2015). Furthermore, examining real world prosocial behaviour has also found the emergence of prosocial behaviour in younger infants in collaborative tasks such as feeding and dressing (Hammond, et al., 2017).

Previously, researchers have attempted to overcome challenges related to limited development in toddlers by applying meaning to toddlers' behaviours based on approximations to adult behaviours (see Rheingold, 1982). For example, an adult may observe someone that needs help opening a door and proceed to engage in "problem solving" by opening the door for that otherwise incapable person. A toddler, when presented with a similar, but albeit unusual situation in which an adult is unable to open a drawer because their hands are full, may also engage in "problem solving", assisting the adult by opening the drawer (Warneken & Tomasello, 2006). The present work takes a similar approach, modifying toddler-based problem-solving and participation tasks for infants and applying meaning to infants' behaviour based on approximations to toddlers' behaviours in similar tasks.

Needing help

Prosocial behaviour research has explored how infants give help to others; however, infants also need help and they likely develop strategies to request it. Presently, very little is known about how infants request help. Most available research tackles infants' understanding of others' use of gestures and interactions to elicit help from others, rather than infants' own use of these gestures and interactions (Dahl, 2021; de Barbaro et al., 2016). This brings us to the cornerstone of the second presented study, which aims to understand for the first time, infants' actual use of gestures, interactions, and other behaviours to elicit help from others.

Given that it is known that infants both receive and participate in the help that they receive, it is possible that over time, infants learn how to use strategies to request help from these previous interactions. In fact, previous studies have found that infants with a history of successful helping interactions with an individual are more likely to help that individual in the future (Cirelli et al., 2014). This means that infants may be more likely to request help from an individual they have a shared history of helping with because there are previously established patterns of eliciting and providing help to each other.

Further, because infants in early infancy are pre-verbal, gestures and physical interactions with others are important to consider when attempting to understand how infants might request help from others. Research has already determined that infants understand others' use of gestures (e.g., informative pointing; Hamlin et al, 2007; give me gesture; de Barbaro et al., 2016; Juvrud et al., 2019) by the end of the first year of life. However, what is not well understood is when and how infants begin to take their understanding of the gestures that others use to request help, to then attempt to request help for themselves. It is not well known whether infants use behaviours like those used by others in their environment, if they produce different behaviours, or whether

they produce any behaviours at all. It is believed that addressing this gap in the literature by observing this transition from understanding gestures and interactions, to using gestures and interactions in established helping relationships is an essential next frontier for prosocial development researchers.

The Present Research

Evidently, research across theoretical backgrounds, testing environments, and developmental domains all indicate that young infants likely have the propensity to engage in prosocial behaviours. What is not well known is what these earliest prosocial behaviours look like, how infants and their caregivers elicit and engage in mutual acts of prosocial behaviour, and how these behaviours develop over time. The presented research targets this next frontier in infant research by observing for the first time the prospective emergence of prosocial behaviours in infancy, in the naturalistic environment of the home. This research also addresses for the first time whether infants solicit help from others, and if they do, what these behaviours look like in the home. Traditionally, naturalistic observation of infant behaviour has been completed by direct observation in the home by the experimenter (Dahl, 2015), but with recent advancements in technology, and increasing accessibility to this technology, some researchers have begun observing naturalistic interactions through video conferencing (Libertus & Violi, 2016). These remotely conducted studies can provide novel insights into earlier emerging behaviours because observed interactions can include realistic experiences infants typically encounter in their natural environment. To accomplish these research goals two main studies were conducted. These studies and their respective results are outlined next.

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Chapter 2: Study 1

Mothers' Communicative Cues and the Development of Infants' Instrumental Helping: Linking Participation and Problem Solving in the First Year of Life

Abstract

The current debate on the development of the variety of *prosocial behaviour* known as *instrumental helping* hinges on opportunities for socialization in infancy. Through experimental research socialization is known to be efficacious. However, because instrumental helping is primarily conceptualized as a form of *problem solving* few real-world opportunities for socialization are thought to exist. Instrumental helping can, however, also take the form of *participation*, assisting by working alongside others where opportunities for socialization abound. Although problem solving is essential to understanding the moral significance of instrumental helping, participation provides opportunities for its socialization. The present study demonstrates a link between participation and problem solving through mothers' communicative cues in both forms of instrumental helping. Forty mother-infant dyads engaged in two semi-structured instrumental helping tasks, a hand-over task (as a participation task) and an out-of-reach task (as a problem-solving task) at five, eight, and ten months of age. Mothers' communicative cues and infants' return of the target object were examined using coding schemes adapted from prior research. Mothers used similar communicative cues (reaches, give-me gestures, and verbal requests) in both tasks. Infants return of objects across the two task contexts followed similar trajectories, although infants showed higher object handover in the participation task. The findings offer support for Tomasello's neo-Vygotskian account of prosocial development, where prosocial behaviour emerges first between people, and then becomes individualized.

Keywords: prosocial behaviour; instrumental helping; socialization; scaffolding; infants

Mothers' Communicative Cues and the Development of Infants' Instrumental Helping: Linking Participation and Problem Solving in the First Year of Life

Once the frontier, infancy is now the focus of research on moral development (Lapsley & Carlo, 2014). A great deal of the research on infant moral development has examined *prosocial behaviors*, voluntary behaviour that assists others. One form of prosocial behaviour, *instrumental helping*, which involves assisting another achieve a goal, is known to emerge in the first year of life (Hammond et al., 2017; Köster et al., 2019). There is an ongoing debate around the role of socialization in the emergence of instrumental helping, which currently rests on the dearth of opportunities for the socialization of this form of helping. The present article will present a possible route for the socialization of instrumental helping first by identifying two forms of instrumental helping, *problem solving* and *participation*. Although problem solving is essential to understand the moral significance of instrumental helping, nevertheless, participation is needed to explain its development. No research has directly examined the connections between these two forms of instrumental helping.

Problem Solving and Participation: Implications for Socialization

Most research on instrumental helping has implicitly taken *problem solving*, which is a form of intervention to assist another (e.g., an infant retrieving an object for an adult who was unable to do so), as the paradigmatic case of instrumental helping. The term problem solving captures an infant using their own understanding to independently assist another (see Keen, 2011). The heavy focus on problem solving in the instrumental helping literature is defensible to the extent that problem solving resembles behaviour that would be called moral if performed by adults (Carpendale, et al., 2013). Research on problem solving has relied heavily on *out-of-reach* tasks in which an experimenter is feigning inability to obtain an object within an infant's reach

(see Warneken & Tomasello, 2006 for a prominent example). Out-of-reach tasks can be structured to require relatively less locomotor ability than other forms of instrumental helping (e.g., as compared to what Warneken and Tomasello, 2006 call a "physical obstacle" task that involves crossing a room to open a door) particularly if the object is dropped close to the infant (Köster et al., 2019), and therefore can be used to examine the early emergence of problem solving. In interactions between an experimenter feigning to be unable to retrieve an object and an infant, problem solving has been observed in infants as young as ten months.

The research literature on instrumental helping and problem solving emerging in the early 21st century gelled around a nativist, or "natural tendency," and socialization debate (see Brownell, 2016). That debate has its grounds in part because of the comparative evolutionary perspective taken in some of the research, which is otherwise beyond the scope of this paper (see Warneken & Tomasello, 2006 for a comparison of problem solving between chimpanzees and human children). In the intervening period, accumulating evidence, notably through training studies, has shown that the direct socialization of problem solving increases infants' capacity to assist another person (Dahl et al., 2017; Dahl et al., 2021; Xu et al., 2016). To the extent that the efficacy of socialization is demonstrated (c.f., Warneken & Tomasello, 2013), a debate around socialization remains. That is because even if socialization for problem solving is effective, situations that require an infants' intervention appear to be rare (Hammond & Drummond, 2019; Warneken & Tomasello, 2006; Zahn-Waxler et al., 1992), seemingly limiting the opportunities for naturalistic socialization (i.e., outside of training studies) to take place.

Yet linked to the issue of rarity, there is a less often recognized, but far more typical form of instrumental helping termed *participation*, which is working alongside others (e.g., caregivers) to accomplish some goal such as to clean up, or do other household tasks (Dahl,

2015; Hammond & Brownell, 2018; Rheingold, 1982), including assistance with daily care, such as feeding and bathing (Hammond et al., 2017). Ironically, Rheingold's (1982) pioneering research paper on instrumental helping, widely cited and influential in the subsequent literature on problem solving, was titled "Little children's *participation* in the world of adults, a nascent prosocial behaviour [*italics* added]," and explored how children work alongside adults on daily chores. Parents are known to invite and praise infants' participation in daily chores (e.g., Dahl, 2015), encourage "gesture games" of handing objects back and forth (e.g., Carpendale et al., 2021), and many other studies have examined parental socialization of children's cleaning up and other chores (notably the literature on committed compliance, e.g., Kochanska, 2002). In addition to the literature on participation in Western families, and although beyond the scope of the present article, there is a rich literature arising within anthropological perspectives that documents young children's participation in Indigenous and traditional cultures (see e.g., Alcalá et al., 2014; Lancy, 2018). Interestingly, research on participation has not engendered an analogous nature-nurture debate as in the literature on problem solving, perhaps because of this more anthropological perspective.

Relatively little is known about the connection between the two forms of instrumental helping. Methodologically, problem solving has largely been examined in structured experimental contexts, typically with a researcher feigning to be unable to complete a task, whereas participation has largely been examined in naturalistic (e.g., at home) or semi-structured (e.g., parents asked to clean-up alongside children in a lab) contexts (Dahl, 2017; Rogoff et al., 2018). Even within these methodological differences, some past research has found correlations between participation and problem solving, such that parents who better scaffold their infants' participation in chores also have infants who engage in more and more competent problem

solving with strangers (e.g., Hammond & Carpendale, 2015; Pettygrove et al., 2013). One goal of the present study is to bridge the methodologies used to examine both forms of instrumental helping (in this case by adapting semi-structured tasks that are characteristic of participation research, and by adapting the communicative cues, to be described further below, that are characteristic of research on problem solving).

Linking Problem Solving and Participation: Hebbian Insights

As described above, participation is uncontroversially thought to be socialized by parents, whereas problem solving, though amenable to socialization, is assumed to be so rare as to offer few occasions for socialization to take place. One way to link these two forms of instrumental helping is found in an insight first proposed by Hebb (1949/2002) in the *Organization of behaviour* in which it is described that there are "responses that are fully dependent on learning but are not learned in the usual sense of the term" (p. 245; this example covers the learning of a fear response, however, see also Hebb et al., 1971 for a similar argument applied to language learning). If we accept the contention that problem solving has few opportunities for socialization, it could be that its socialization occurs indirectly, through participation. Rather than showing a correlation, as in past research linking problem solving and participation, a goal of the present study is to examine whether there are some similar mechanisms operating in both forms of instrumental helping.

Communicative Cues in Problem Solving and Participation

Research on problem solving is structured around a researcher emitting a series of prescribed communicative cues, such as gestures (e.g., looking back and forth between the object and the child; reaching for an object; a give-me gesture) and vocalizations (e.g., "Can you help me?") that are deployed sequentially to prompt problem solving behaviours in infants (see e.g.,

Drummond et al., 2017; Dunfield, et al., 2011; Hammond & Carpendale, 2015; Svetlova et al., 2010; Warneken & Tomasello, 2006). In general, communicative cues are portrayed "clues" for the infant to solve the problem at hand and are doled out in a prescribed fashion based on the commonsensical assumption that earlier cues (such as an exclamation like "Oh!") are more difficult to respond to than an explicit verbal request for help.

The communicative cues used in research on problem solving do seem to be natural kinds which occur in daily activity such as the use of a palm-up "give-me gesture" and reaching, which are deployed in joint activity between caregivers and infants (de Barbaro et al., 2013) (Carpendale et al., 2021). It is less clear whether the sequence of communicative cues used in experimental work are characteristic of naturalistic interaction. Nevertheless, if communicative cues are naturally occurring then it could be that similar gestures and vocalizations occur in both problem solving and participation contexts providing a mechanism by which infants can learn about the former through experience with the latter, though these assumptions have yet to be examined empirically. It may also be that parents deploy cues that are in some ways qualitatively different from those used in experimental scenarios. For example, researchers, circumscribed by study constraints, typically do not directly touch an out-of-reach object to signal to infants that they wish to have it returned, whereas parents in more naturalistic settings may do so.

Communicative Cues and Levels of Support

Training study designs used in studies of the socialization of problem solving (e.g., Dahl et al., 2021) and examinations of scaffolding in semi-structured participation (e.g., Hammond & Carpendale, 2015) provide a way to order communicative cues as offering more or less support, or scaffolding, for the infant. More heavily supported direction will come closer to modelling the desired behaviour (e.g., a parent modeling writing may actually write an example of the letter

"E"), whereas more indirect efforts will do so more obliquely (e.g., "Hmm, is that letter facing the right direction?"). See Table 1 and below for the way in which mothers' cues in the present studied were classified in terms of levels of support.

Present study

The overarching goal of the present study was to link participation and problem solving in our overall understanding of infants' instrumental helping. To do so, the study examined mother-infant dyads' interactions in semi-structured tasks intended to model both contexts of helping, and mothers' use of communicative cues in both contexts. If mothers and their infants deploy and develop patterns of communicative cues through commonplace forms of participation, then, these learned interactions could be generalized to other situations, such as problem solving situations that are rare. To paraphrase Hebb (1949/2002), this could lead to behaviour that is dependent on socialization but not socialized in the usual sense of the term. To our knowledge, this is the first study to examine the issue of problem solving and participation in this way.

The same dyads were met at five, eight, and ten months of age, ages overlapping with research on the emergence and socialization of instrumental helping (e.g., Hammond et al., 2017; Dahl et al., 2021). Dyads engaged in semi-structured naturalistic interactions with a participation task (a hand-over task, in which mothers handed over an object and then requested its return) and a problem-solving task (an out-of-reach task, in which mothers dropped an object in the infants' lap). Mothers' elicitation of object return was coded according to the communicative cues drawn from structured experimental research (e.g., Svetlova et al. 2010), adapted to examine how mothers use cues with their infants, and further classifed by level of support (see Table 1).

Infants' actions were coded for the return of the object to the mother, again using coding schemes drawn from past research (Zahn-Waxler et al., 1992).

Hypothesis Regarding Mothers' Use of Communicative Cues

For mothers, the following hypothesis was examined, coupled with some exploratory questions:

Hypothesis 1) Mothers will spontaneously use communicative cues and use similar communicative cues across the two tasks.

In addition to the hypothesis above, we also explored the types and ways in which mothers used communicative cues across ages.

Hypothesis Regarding Infants' Return of the Object

For infants, the following hypothesis was examined regarding the return of the object:

Hypothesis 2a) Infants will release the object more often with age.

Hypothesis 2b) Younger infants' release of the object will require more direct support.

Method

Participants

Participants included 45 mother-infant dyads living in Canada that were initially recruited to participate in a larger longitudinal study on social development, with data collection occurring remotely to facilitate a naturalistic observation of infant-mother interactions in the home environment (using electronic surveys and synchronous meetings with researchers using videoconferencing software). For the present study, the final sample was 40 dyads (17 female; 23 male), with four participants removed at various time points due to technical or experimenter errors for some tasks and one removed for being outside of the desired age parameters. A paired samples t-test G*power3 sensitivity power analysis (Faul et al., 2007) with 40 participants would

be sensitive to effects of Cohen's d=.45 with 80% power (alpha=.05, two tailed). This means the study would not be able to reliably detect effects smaller than Cohen's d=.45. Included dyads were met at five (M_{age}=159.1days, Sa_{ge}=5.83 days, Range=151-172 days), eight (M_{age}= 250.32 days, SD_{age}=6.69 days, Range=239-265 days) and ten (M_{age}= 314.87 days, SD_{age}=7.77 days, Range=303-333 days) months of age. Across the three time points, some dyad data is missing because of time and task specific data collection issues (i.e., technological difficulties, scheduling challenges, incomplete tasks) that contributed to non-attrition based variation in task and time sample sizes which are reflected below. Infants' reported race/ethnicity was 60% European, 22.5% other North American, 7.5% were Asian/Pacific Islander, 5% were Mixed Race, 2.5% were Semitic, and 2.5% chose not to identify. Over half of mothers reported a graduate degree (57.5%), 27.5% had a bachelor's degree, 12.5% had a college degree, and one mother chose not to report.

Materials and Procedures

Participants were recruited through advertisements on Facebook which noted the technical requirements for participation in the study (a strong Internet connection and access to a smart device or computer with videoconferencing software). Most of the data collection was collected in 2018 to 2019, before state of emergency measures brought by the COVID-19 pandemic, except for 13 dyads, whose final data was collected in or after March 2020. Mothers gave consent for participation at each time-point. Shortly before the videoconference session, mothers filled out a set of questionnaires using the survey software Qualtrics, which included demographics, and a battery of social and motor measures. The videoconference sessions included four dyad tasks (a dressing task, the hand-over task, the out-of-reach task, and a free play task) in a fixed order. In the dressing task, mothers were asked to put a hat on the infant, and

in the free play task they were asked to play with their infant as they normally would. Additionally at Time 3 (10 months) two additional tasks took place, an empathy task (Zahn-Waxler et al., 1992), and a snack-sharing task (adapted from Svetlova et al., 2010), both occurring after the hand-over and out-of-reach tasks, and before the free play task. Only the hand-over and out-of-reach tasks are described below. At each virtual testing session, mothers were given instructions to set-up the camera to ensure that the experimenter had a full view of the child. Mothers were also instructed in the delivery of a specific series of tasks involving the infant. Additionally, the initial session included an introduction to videoconference principles such as camera placement, following procedures described in Libertus and Violi (2016).

Hand-Over Task

In the participation-based hand-over task, mothers were instructed to place a small object in their infants' hand (mothers were asked to use a marker). Mothers were then instructed to get the object back from their infant as they normally would after 10-15 seconds. This task was intended to simulate forms of participation that are typical occurrences in the home (e.g., Carpendale et al., 2021).

Out-of-Reach Task

In the problem-solving based out-of-reach task (adapted from the similarly named instrumental helping task described in Warneken & Tomasello, 2006), mothers were asked to drop a small object in the infants' lap or on a tray if the infant was seated in a highchair (mothers were asked to use a sock that was nearby from the dressing task). Mothers were then asked to say "Oops!" and then wait 10-15 seconds before retrieving the sock from the child as they normally would. This task was intended to simulate a problem-solving situation where a parent required an infants' help (*ibid*, p. 1302).

Measures

Measures to code infants' and mothers' behaviour during the hand-over and out-of-reach tasks were adapted from past research on prosocial behaviour.

Mothers' communicative cues.

Mothers' naturalistically occurring communicative cues were coded based on an adaption of the communicative cues used to describe researchers' structured behaviour in an instrumental helping task (e.g., Drummond et al., 2017; Svetlova et al., 2010). Based on mothers' behaviours, retained codes were a palm up "give me" gesture, a reaching grasp with "pincer" or "full finger grasp" gesture, and a verbal request (e.g., "Can I have it please?"). Additionally, in the out-of-reach task, mothers were specifically asked to say "oops," as done in both the Drummond and colleagues (2017) and Svetlova and colleagues (2010) studies. For each of the retained codes (except for the "oops" statement that mothers were directly requested to perform), mothers were assigned a code of one if they engaged in the gesture during the task. Each mothers' behaviour was examined by the primary author and an independent coder, and a Krippendorf's alpha was assigned to each behaviour. The alphas were .93 for the give me gesture, .83 for the reach gesture, and .90 for the verbal request. After reliability coding was completed, in cases of disagreement, discussion was used to resolve the disagreement.

Level of support. As described further in Table 1, the gestures above were further coded according to level of support: direct, indirect, and low support. If a mother provided direct support (i.e., a reaching grasp that touched the object), the dyad was assigned a score of 1. If a mother provided indirect support (i.e., a mother does not physically touch the object and used either a give-me gesture or a verbal request, or a combination of the two) the dyad was assigned a 2, and if the mother used low support (i.e., no communicative cue) the dyad was assigned a 3.

Infants' return of the object.

Infants' return of the object was coded based on an adaptation of Zahn-Waxler and colleagues (1992) coding scheme for prosocial behaviours. Infants that *failed to engage* with the object (e.g., did not pick up the object) were given a dummy code of two because our focus for infant behaviour was related specifically to whether infants released the object to the request or not. Infants that appeared to copy the mothers' behaviour (e.g., dropping the object away from the mother) were given a dummy code of zero for *self-referential* behaviour (Zahn-Waxler and colleagues depict this as relevant to prosocial behaviour). Instances of infants' not engaging with the object and self-referential behaviour were both rare and there was full agreement. Infants' who *released* the object to the mother were given a code of one. To code releasing the object, researchers observed whether there was a clear release of the object that was not forced by the mother (e.g., the mother simply removed the object from the infants' hands). A clear release was characterized by the infants' independent uncurling of their fingers from the object. The primary author and an independent coder coded all the dyads at each time-point. For infants' release of the object to the mother, a Krippendorf's alpha (Hayes & Krippendorf, 2007) was calculated, with an alpha of .98. After reliability coding was completed, in cases of disagreement, discussion was used to resolve the disagreement. Zahn-Waxler and colleagues (1992) depict the release of the object as prosocial behaviour, however, additional distinctions were made in the present study as described below.

Results

Preliminary Analyses and Data Reduction

As described above, initially, six maternal communicative cues were examined in our sample (i.e., verbal expression, alternating gaze, give-me gesture, reaching grasp gesture, general

verbal request, and specific verbal request). Spontaneous verbal expression (e.g., an exclamation) and alternating gaze were observed infrequently, and so were not included in our analysis. There were also relatively few instances of general verbal requests (e.g., "can you help me?"), however, these responses were combined with specific verbal requests (e.g., "can you give me that?") to create a combined category for verbal requests (see Table 1). Mothers' reaching grasps all involved touching the object in the infants' hand, although not actually removing it by force (e.g., tugging on it). That is different than in structured studies of instrumental helping where reaching, (e.g., a reach with a "pincer grasp") can occur at a distance (e.g., reaching at an object across the room). In contrast, mothers' give-me gestures all involved no contact with the requested object (e.g., orienting a palm near or underneath the object without touching it). Lastly, some mothers produced no communicative cue, so this category was added.

Mothers' Communicative Cues and Levels of Support

Across tasks and time, mothers tended to produce more than one communicative cue (see Table 2). An exception to that is at Time 1 of the out-of-reach task, where mean number of communicative cues was below 1. Over tasks and time, mothers produced more cues in the hand-over task (260 cues out of 342 possible instances [i.e., summing up 38 mothers at Times 1 through 3, producing a reaching grasp, give-me gesture, and verbal request]) than the out-of-reach task (153 cues out of 336 possible instances). At Time 1 mothers produced significantly more cues in the hand-over task (M=2.16, SD=.79) than the out-of-reach task (M=.87, SD=1.09) with a paired t-test, $t(37) = 6.47$, p=<.001; d=1.23. At Time 2, mothers likewise produced significantly more cues in the hand-over task (M=2.36, SD=1.11) than the out-of-reach task (M=1.75, SD=1.30) with a paired t-test, $t(35) = 2.55$, p=.008 d=1.44. And at Time 3, mothers

again produced significantly more cues in the hand-over task (*M*=2.53, *SD*=.81) than the out-of-reach task (*M*=1.72, *SD*=1.34) with a paired t-test, *t*(35) =3.25, *p*=.001; *d*=1.49.

Across tasks and time, the most produced communicative cues were the verbal request (67% of instances [derived from a grand total of 152 times across tasks and Time 1 through Time 3 of a possible 226 instances]) the reaching grasp (66% of instances), and the give-me gesture (49% of instances). Mothers produced no communicative cues in 21% of instances. Examined by time and task, however, although the reaching grasp and verbal request were consistently the top two cues produced, mothers produced fewer instances of no communicative cues in the hand-over task (4% of possible instances) than in the out-of-reach task (39% of possible instances). Uniquely, at Time 1 of the out-of-reach task, mothers produced more instances of no communicative cue than any particular communicative cue. Across tasks and time, mothers most often offered direct support (66% of instances), followed by low support (21% of instances), and indirect support (12% of instances). Of note, although some infants were disengaged with the object across tasks and time, mothers were engaged and had the opportunity to interact with their infant. Thus, codes for mothers' own behaviour were retained despite infants' disengagement with a given task.

Infants' Release of the Object.

Across tasks and times, infants released the object more often in the hand-over task (52% of possible instances) compared to the out-of-reach task (31%). By time and task, in the hand-over task, 15 infants released the object at Time 1 (*n*=38), 23 did so at Time 2 (*n*=38), and 21 did so at Time 3 (*n*=38). In the out-of-reach task, seven infants released the object at Time 1 (*n*=40), 14 did so at Time 2 (*n*=36), and 14 did so at Time 3 (*n*=36). Although more infants helped at Times 2 and 3 than Time 1, McNemar test did not find a significant difference between

likelihood to help for individual participants by age for the hand-over task. In contrast, Infants were significantly more likely to release the object in the out-of-reach task at Time 3 over Time 1 (p=.04). Comparing across tasks, McNemar tests found that individual infants were not more likely to release the object in the hand-over task compared to the out-of-reach task at Time 1 or Time 3 but were more like to do so at Time 2 (p=.02).

Infants Release of the Object and Levels of Support.

As shown in Figure 1, across times and tasks, infants who released the object were more likely to have done so when a mother gave direct support (i.e., used a reaching grasp which touched the object). All infants who released the object at Time 1 in both tasks did so to direct support. It was only at Time 2 and Time 3, in both tasks, that infants began to release the object when presented with either indirect (i.e., a verbal request, or give-me gesture, or a combination of both) or no support (i.e., no communicative cue). At Time 2, however, in both the hand-over task ($\chi^2(2) = 25.17$, $p<.001$) and the out-of-reach task ($\chi^2(2) = 13.35$, p=.001), a Cochran's Q test found that infants' likelihood to release the object was significantly different in relation to level of support. Similarly, at Time 3, in both the hand-over task ($\chi^2(2) = 30.37$, $p<.001$) and the out-of-reach task ($\chi^2(2) =8.18$, p=.02), a Cochran's Q test found that infants' likelihood to release the object was significantly different in relation to level of support.

Discussion

The present study is the first to directly examine links between maternal socialization of instrumental helping across participation and problem solving. The study is also the first to examine whether communicative cues used in the experimental study of infant problem solving arise in naturalistic interaction. Overall, the study found that mothers spontaneously produced some of the communicative cues used in the experimental literature on problem solving, namely

reaching grasps, give-me gestures, and verbal requests, as well as instances of no communicative cues, and did so in both problem-solving and participation contexts. The findings supported hypothesis 1, finding that mothers produce similar cues in both participation and problem-solving contexts, although they tended to produce more communicative cues in participation than problem-solving contexts. The study also supported hypothesis 2a, identifying that infants released the object to their mothers in both task contexts more often when mothers used communicative cues that offered direct support and scaffolding. Older infants were more likely to release the object in the problem-solving task with age, but not so with the participation task, partially supporting hypothesis 2b. Individual infants were generally not more likely to release the object in participation over problem-solving contexts.

Mothers' Naturalistic Use of Communicative Cues and Implications for Understanding Problem Solving and Participation

The finding that mothers produce at least some communicative cues that are used in structured studies of instrumental helping in the lab, and do so in both participation and problem-solving task, provides some ecological context to claims that infants are unlikely to have been exposed to situations involving problem solving (e.g., Warneken & Tomasello, 2006). Even if claims that problem-solving context of instrumental helping are rare in daily life (e.g., Zahn-Waxler et al., 1992) are accepted, the present study suggests that aspects that arise in these problem-solving tasks in the lab may be familiar to infants because of their experiences in participation contexts of instrumental helping in the home. Although the perspective of evolutionary researchers that infants are unlikely to have received much socialization for problem solving specifically may be correct, following the Hebbian idiom, infants'

understanding of problem solving may nevertheless be dependent on prior learning (i.e., learning that occurred in more familiar instances of participation).

Conversely, the finding that mothers spontaneously use communicative cues should provide at least some pushback on concerns about problem-solving tasks' ecological validity (Rogoff et al., 2018). The present study provides at least some evidence that while problem-solving tasks may be unusual for both infants and mothers, in terms of both frequency and content, elements of them that are examined in structured research have a basis in mothers' and infants' lived reality.

Level of Support and Infant Helping in the First Year of Life

The present study found that infants were capable of helpful behaviour as young as five months of age, in both participation and problem-solving contexts, but only when supported by parental scaffolding. That finding is supported by work of other researchers (e.g., Dahl et al., 2021; Hammond et al., 2017; Xu et al., 2016). In contrast, problem solving in more structured studies where infants assist researchers by returning out-of-reach objects is only found around ten months of age. The present study offers further context for these findings in showing how a small number of infants began to return objects to their mothers to more indirect support (e.g., a give-me gesture) or low support (e.g., no communicative cues) at eight and ten months of age (see figure 1).

The present study supports past research that greater parental scaffolding and support for infants' helping (in this case in releasing an object) is important, particularly at younger ages (e.g., Dahl et al., 2017; Dahl et al., 2021). The present study shows how in principle similar forms of support are effective in both problem-solving and participation contexts. In this way, the present study could be a possible mechanism by which more supportive scaffolding of

participation contributes to greater problem solving (e.g., Hammond & Carpendale, 2015; Pettygrove et al., 2013), namely that similar communicative cues could underlie both forms of instrumental helping.

Other Observations

At five months we observed that infants' engagement varied between the participation and problem-solving tasks. In the participation task all infants were engaged with the object at some point in the task at five months. This differed from the problem-solving task, where almost half of five-month-old infants were disengaged with the object at some point in the task. Interestingly, despite infants' disengagement with the dropped object, some mothers continued to provide a degree of support to their infants during the task. Thus, although mothers of disengaged infants were afforded fewer opportunities to intervene with their infant in the problem-solving task, some mothers continued to do so. This observation provides some direction for future research, which may wish to consider how infants transition from participation to problem-solving after 5 months of age, and the role that mothers play in this transition.

Of note, some mothers employed playfulness to try to elicit a release from their infants. These observations were not anticipated but seemed important to acknowledge. For example, these mothers changed their vocal tone and used facial expressions commonly associated with playfulness. There were few instances of this behaviour observed, but this behaviour was never associated with a successful response from infants. This anecdotal finding offers mixed support for researchers who have claimed that positive emotions could play a role in the development of prosocial behaviour (e.g., Hammond & Drummond, 2019; Rheingold, 1982). At least some researchers have noted how positive emotions contribute to infants' increased engagement in

participation yet can also create more challenges for parents (as the infant does things "their way"; Forman, 2007; Hammond & Brownell, 2018).

Participation and Problem Solving

The present study has shown support for the idea that problem solving could emerge from participation. The present study used an idea derived from Hebb (1949/2002) to support that insight, however, a different though compatible way to consider the issue is to argue that infants learn about participation through routine social interaction, and then apply that knowledge in situations of problem solving. It is possible to regard problem solving as a special case of participation (see De Jaegher et al., 2010; Warneken et al., 2006). That way of framing the issue fits into Tomasello's (2019) neo-Vygotskiian perspective on human development. In other words, instrumental helping could develop first with others (i.e., participation) and then become an individualized skill (i.e., problem solving). Ironically, Tomasello and colleagues' research on prosocial behaviour has tended to defend a "natural tendency" account of prosocial behaviour, that downplays the importance of socialization.

Limitations and Future Directions

Unlike the circumscribed communicative cues used in structured studies of problem solving, the present study examined mothers' spontaneous use of communicative cues. The present study attributed the use of no communicative cues to some mothers. Although we think it is appropriate to think of these instances as cases where mothers provide relatively lower levels of support and scaffolding for infants, we would not wish to argue that mothers are somehow doing or communicating nothing in these instances, or to imply that they were ignoring their infants. All mothers were engaged with the tasks at hand and were looking at and engaged with

their infants – they were not, however, using the reaching grasp or give-me gesture, or engaging in a verbal request.

Given the use of telemetric (remote) data collection in the present study, there were some factors beyond our control. In rare instances, the presence of other people or animals in the testing environment and other environmental distractions (i.e., televisions, windows) may have contributed to infant distraction, and in a small number of cases, poor Internet connections resulted in the loss of data.

Although mothers were provided with the same instructions, given the naturalistic delivery of this study, some variance in task administration and experimental environment could be avoided in a lab-based experimental setting (i.e., size/shape/colour of object, windows or other room features). This could have impacted a few of the infants' interest in the object, ability to handle the object, or overall attention to the task at hand. In terms of observing alternating gaze behaviours, the technological constraints of this study did not enable reliable coding and so we were not able to determine the true use of this communicative cue and its potential relationship to infants' hand-overs. This could be improved in the future with eye-tracking technology. Given the increasing availability of virtual technology, future studies may wish to engage in even more naturalistic observations using observations obtained virtually in infants' homes.

Finally, the post-hoc sample size power analysis is a limitation of the present work. Although the nature of this study is exploratory and descriptive, the power of future work could be strengthened by conducting a priori power analysis to determine an adequate sample size. This method would support future researchers in determining the strength of the relationships

identified between participation and problem-solving and the roles infants and mothers play in their development.

Conclusion

To return to the metaphor of frontiers noted at the outset of the present study, infants' emerging capacity to help others in trouble (i.e., problem solving) marks an important feature on the horizon of the study of moral development. Although participation, is not an explicitly independent demonstration of moral behaviour, it may provide a path to understanding how prosocial behaviour develops. The present study has demonstrated how, through mothers' use of communicative cues, these two contexts of early instrumental helping may be related.

Table 1

Mothers' Communicative Cues by Type, Description, and Level of Support

Communicative Cue	Description and Coding	Level of Support
Reaching Grasp	Mother's hand reaches for and makes contact with the object but does not physically remove the object from the infants' hand (e.g., tugging occurs, but object is not wrenched from the infant).	Direct
Give-Me Gesture	Mother's hand extends palm up and hovers near or under the object in the infants' hand. There is no contact with the object.	Indirect
Verbal Request	Mother utters a general or specific request for the object or an action (e.g., "Can I have it?"; "Can you give that to me?")	Indirect
No Communicative Cue	Mother is attentive but does not do any of the above.	Low Support

Table 2

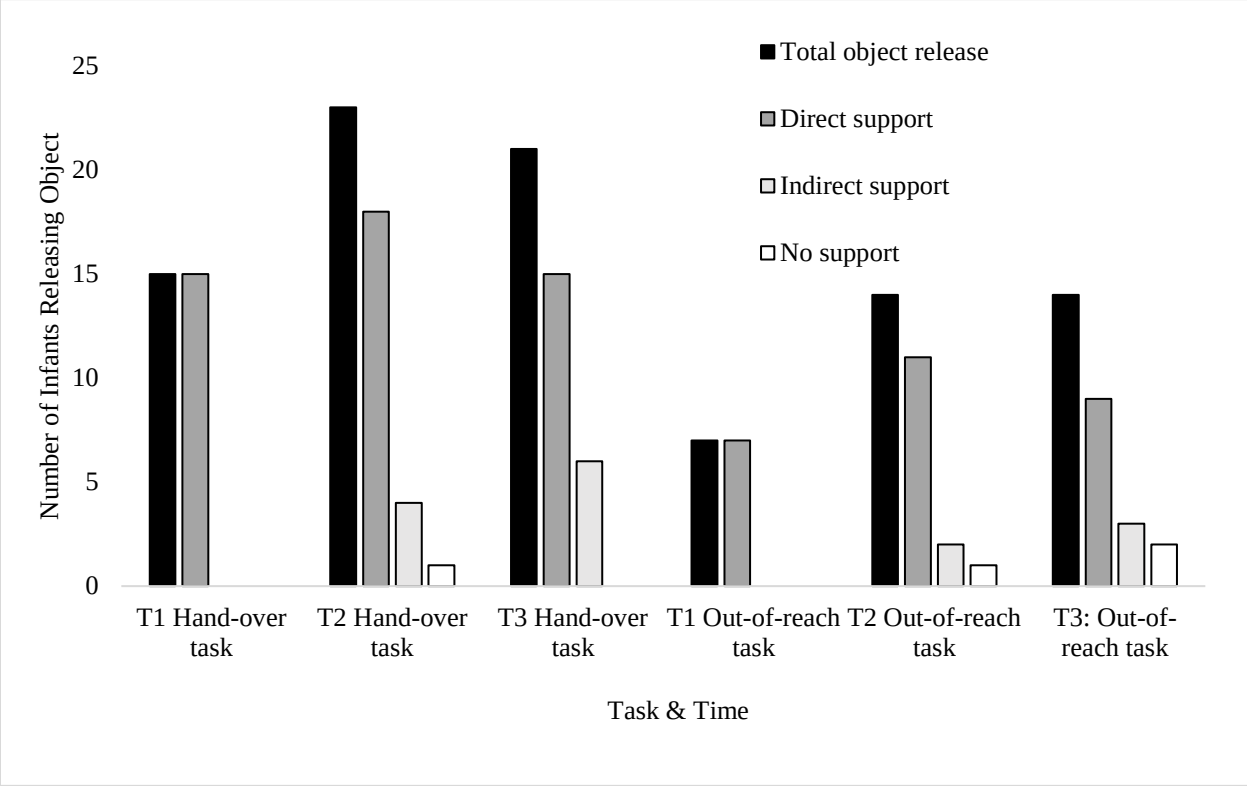
Mothers' Use of Communicative Cues in the Hand-Over and Out-of-Reach Tasks at Time 1 through 3 and Levels of Support

Hand-over task							Out-of-reach task						
	All communicative cues used					Maximum level of Support Offered		All communicative cues used					Maximum level of Support Offered
	RG	GM	VB	NCC	$M_{\#CC}$			RG	GM	VB	NCC	$M_{\#CC}$	
T1 (n=38)	38	16	27	0	2.13 (.74)	Direct: 38 (100%) Indirect: 0 (0%) Low: 0 (0%)	T1 (n=40)	16	4	12	22	.80 (1.02)	Direct: 16(40%) Indirect: 2 (5%) Low: 22 (55%)
T2 (n=38)	27	26	34	3	2.29 (1.09)	Direct: 27 (71%) Indirect: 8 (21%) Low: 3 (8%)	T2 (n=36)	22	18	22	11	1.68 (1.27)	Direct: 22(61%) Indirect: 3 (8%) Low: 11 (31%)
T3 (n=38)	28	29	35	1	2.42 (.72)	Direct: 28 (74%) Indirect: 9 (24%) Low: 1 (3%)	T3 (n=36)	19	18	22	11	1.64 (1.25)	Direct: 19(53%) Indirect: 6(17%) Low: 11 (31%)

Note. Abbreviations are as follows: RG= reaching grasp; GM= Give-me gesture; VB= Verbal request; NCC= No communicative cue; CC= Communicative cues. In column with $M_{numberCC}$, standard deviations are in parentheses. Numbers in support level column represent number of dyads classified at that level of support.

Figure 1

Infants' Release of the Object by Task and Time and Degree of Maternal Support



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Chapter 3: Study 2

Infants need help too: Infants' instrumental helping and requests for help at 10-months

Abstract

Although adults rarely require an infant's instrumental help (i.e., voluntarily assisting another person to reach a goal), infants often require instrumental help from others, and understanding how infants solicit instrumental help in relation to ways adults solicit help sheds new light on the early development of instrumental helping. We explored how 34 infant-mother dyads attempt to elicit instrumental help from each other. Participants engaged in two semi-structured out-of-reach style instrumental helping tasks, one where the mother required assistance from their infant, and for the first time in experimental literature, one where infants required assistance from their mother. Infants' and mothers' elicitation, and infants' release of a target object were coded. Infants were found to use behaviours to elicit help from their mothers and their observed behaviours were similar to those used by their mothers and by experimenters in structured experimental tasks. The findings, which connect infants' spontaneous requests for instrumental help with their mothers' and structured experimental procedures, are framed in light of previous experimental literature of infants' instrumental helping of others.

Keywords: prosocial behaviour; instrumental helping; helping behaviour; cooperation; development; infants

Infants need help too: Infants' instrumental helping and requests for help at 10-months

Infants experience a prolonged period of helplessness from birth (Dahl & Brownell, 2019). Thus, every day, infants require the assistance of others to solve problems for them in almost every domain of life. This helplessness creates a social dynamic where infants and caregivers develop patterned social exchanges, in order to solve infants' problems in everyday activities, and it is within these contexts where infants may learn to help others (Brownell & Dahl, 2019; Hammond et al., 2017; Reddy et al., 2013). Research on early *instrumental helping,* or helping another person complete a thwarted goal, focuses almost exclusively on infants' instrumental helping of others and is considered to be rare (Warneken & Tomasello, 2006). However, infants themselves require instrumental helping from others frequently in everyday problem situations. To this point, no one has examined infants' own experience of problems and what they do to elicit help from others when they encounter these problem situations (Dahl 2015; Hammond et al., 2017; Reddy et al., 2013). It is thus the chief aim of this paper to show, for the first time, infants' requests for help in problem situations.

Linking Mothers' & Infants' Action-Patterns

The present literature focuses almost exclusively on instrumental helping as other-focused infant problem solving, wherein adults solicit infants' help through the use of communicative cues such as reaching, vocalizations, and other gestures. Yet, because infants are evolved to be helpless, they encounter their own problems, and must solicit instrumental helping from others. Little is known about infants' own use of gestures and vocalizations to elicit problem solving from their caregivers in the home. It is possible that previous work has neglected this infant perspective of problem solving because it does not fall into the nativist-socialization debate that characterizes much of the present literature on helping (Dahl et al., 2021a) and is instead more clearly associated with a constructivist approach (Allen & Bickhard,

2013; Sokol et al., 2015). Since infants are active agents that engage with others in everyday activities, they participate in, understand, and contribute to the development of common action patterns with those around them (Carpendale et al., 2021; Dahl et al., 2021a; Reddy et al., 2013). Recent research has identified that such action patterns can develop well within the first year of life in triadic object exchanges where infants respond to mothers' requests for objects whether in naturalistic or experimental settings (de Barbaro et al., 2013; Carpendale et al., 2021; Xu et al., 2016, See also Thesis Chapter 2). Given that infants are exposed to and participate in object exchanges at the request of their mothers, so too, within this constructivist framework, should infants, as active agents, be able to apply previously learned action-patterns and develop new patterns to request object exchanges from their mothers in order to obtain a desired object.

Adapting Adult Procedure for Infants

Out-of reach tasks are commonly used to understand infant instrumental helping in laboratory-based experiments and have recently been used in naturalistic settings with mother-infant dyads (Köster et al., 2019; See also Thesis Chapter 2). In lab-based experiments, these tasks use a stepwise application of gestures (i.e., give me gesture) and vocalizations (i.e., "A marker!") to elicit instrumental helping from infants (Svetlova et al., 2010). Recent naturalistic experiments using out-of-reach tasks found that mothers apply a common combination of gestures and vocalizations (i.e., give me gesture, reaching grasps, and specific verbal requests), to elicit participation and problem solving from their infants (Study 1). Evidently, observations of infants' responses to others' use of gestures and vocalizations in instrumental helping problem situations has been widely observed in lab-based experiments, and evidence has been found in naturalistic environments as well. In turn, and as this paper will show, a reversal of these

experimental procedures can contribute to the understanding of the communicative cues infants use to elicit problem solving from others, for the first time.

Present Study

In the present study we observe, for the first time, infants' requests for help from their mothers in the home. We present an empirical study examining 10-month-old infants' and their mothers' request-oriented communicative cues in out-of-reach style instrumental helping tasks. For the first time, we used a role-reversal of a standardized "out-of-reach" task and created a situation where an infant's favourite toy was placed out of their reach, but within their sight by their mother, in order to observe infants' attempts to request help in an instrumental helping task. Mothers' communicative cues were observed in a replication of an out-of-reach task: How mothers retrieve an object dropped onto their infants' highchair tray. In the mother-focused task, mothers' spontaneous communicative cues were coded based on gestures and vocalizations used in structured experiments, and infants' responses were coded based on their engagement with and release of the object. In the infant-focused task, infants' spontaneous communicative cues were coded based on an adaptation of the gestures and vocalizations used in structured experiments. Infants' elicitation cues were described for the first time, and the relationship between their successful response to requests for help and their own requests for help were identified. The following hypotheses were examined;

Hypothesis1: Infants use communicative cues to elicit help from others in retrieving an out-of-reach object.

Hypothesis 2: Infants who successfully respond to their mothers' elicitations for a hand-over of an out-of-reach object will use different communicative cues to elicit help from others than their unsuccessful counterparts.

Method

Participants

34 mother-infant dyads living in Canada were included in the final sample (13 female; 21 male), with one participant removed because of caregiver gender (i.e., father), and three participants removed due to technical errors or incomplete data (i.e., questionnaire incomplete). A one-way between subjects ANOVA with 34 participants across two groups would be sensitive to Cohens f=0.496 with 80% power (alpha=.05). Dyads were met at ten months of age (M_{age}=305 days, SD_{age}=2.5 days, Range=298-313 days). Infants' reported racial/ethnic backgrounds were, 35% European, 32% other North American (I.e., identified as Canadian), 12% chose not to identify, 9% Mixed Race, 6% Asian/Pacific Islander, 3% Black/ African American, and 3% North American Aboriginal. As their highest level of education obtained, mothers reported that 47% had a graduate degree, 35% had a bachelor's degree, 6% had a college degree, and 12% of mothers chose not to report. Participants were recruited through advertisements on Facebook and through a coordinated lab recruitment program at the University of Ottawa, which noted the technical requirements for participation in the study (a strong Internet connection and access to a smart device or computer with video conferencing software). All the data was collected in 2021-2022 during the COVID-19 pandemic, while varying public emergency measures were in place.

Materials and Procedures

Mothers gave consent for participation at the time of the interview and mothers completed a set of demographic and social questionnaires using the survey software Qualtrics. At the time of the videoconference, instructions were given to set-up the camera to ensure that the experimenter had a full view of the child and caregiver (See; Libertus & Violi, 2016). After setting up, experimenters led caregivers through four fixed-order dyad tasks (a hand-over task; a

mother out-of-reach task; an infant out-of-reach task; a snack task). Only data from the out-of-reach tasks are reported here.

Infant Out-of-Reach Task

In a novel application of an instrumental helping based out-of-reach task (adapted from the similarly named instrumental helping task described in Warneken & Tomasello, 2006), mothers were asked to engage their infants with their favourite toy until the infant was interested in the object. Mothers were then instructed to place the object out of reach, but within sight of their infant, at which point the mother would turn away and ignore their baby until instructed otherwise. This task was developed to create a problem-solving situation where an infant required their mothers' instrumental help.

Mother Out-of-Reach Task

In an instrumental helping based out-of-reach task (modelled after a previously used instrumental helping task by Warneken & Tomasello, 2006), mothers were asked to drop a spoon on the tray of their infants' highchair. Mothers were then asked to say "Oops!" and then wait 10-15 seconds before retrieving the spoon from the child like they "normally would". This task simulates a problem-solving situation where a mother requires an infants' instrumental help (*ibid*, p. 1302).

Measures

Measures to code infants' and mothers' communicative cues during the hand-over and out-of-reach tasks were adapted from past research on prosocial behaviour and are described below.

Infants' Behaviour

Infant-Focused Task. Infants' communicative cues were coded based on an adaptation of the communicative cues used to describe researchers structured communicative cues in an instrumental helping task (Drummond et al., 2017; Svetlova et al., 2010). Some categories of cues were excluded for developmental reasons (i.e., general, and specific verbal requests). The remaining cues (i.e., indication of need, internal state, verbal expression, specific naming, alternating gaze, and reaching) were modified by the researchers with developmentally appropriate examples, which are defined in Table 1. Specific naming and alternating gaze were coded infrequently, and were considered rare, and so, reliability was not calculated for these categories. Infants' communicative cues were examined by the primary author and an independent coder, and a Krippendorf's alpha was assigned to each cue. The alphas were 1.00 for indication of need, .91 for internal state, 1.00 for verbal expression, and .85 for reaching. After reliability coding was completed, in cases of disagreement, the primary coder's code was used.

Mother-Focused Task. Infants' communicative cues were coded based on an adaptation of a previously used coding scheme for prosocial behaviours (Zahn-Waxler et al., 1992). Infants that *failed to engage* with the object (e.g., passively held the object or did not pick up the object) or who seemed to copy mothers' behaviour (e.g., dropping the object away from the mother) were given a dummy code of one. Infants who *released* the object to the mother were given a code of two. Release of the object was characterized by whether researchers observed infants' independent uncurling of their fingers from the object, that was not forced by the mother (e.g., the mother simply removed the object from the infants' hands). The primary author coded all of the dyads and an independent coder coded 76% of the dyads. For infants' release of the object to the mother, a Krippendorf's alpha (Hayes & Krippendorf, 2007) was calculated, with an alpha of

.93. After reliability coding was completed, in cases of disagreement, the primary author's code was used. Zahn-Waxler and colleagues (1992) depict the release of the object as prosocial behaviour, however, additional distinctions were made in the present study as described below.

Mothers' Behaviour

Infant-Focused Tasks. Because mothers were instructed to ignore their infants in the infant-focused out-of-reach tasks, codes were not assigned to mothers in this task.

Mother-Focused Tasks. Mothers' spontaneous communicative cues were coded based on an adaptation of standardized structured communicative cues used by researchers in instrumental helping tasks (Drummond et al., 2017, p. 1387; Svetlova et al., 2010). Based on mothers' communicative cues in our previous study (unpublished), retained codes were a palm up "give me" gesture, a reach with "pincer" or "full finger grasp" gesture, and a verbal request (e.g., "Can I have it please?"). In the out-of-reach task, mothers were specifically asked to say "oops," as part of the procedure (See Drummond et al., 2017; Svetlova et al., 2010). For each of the retained codes, mothers were assigned a code of one if they used the gesture or vocalization during the task. Each mothers' behaviour was examined by the primary author and an independent coder, and a Krippendorf's alpha was assigned to each communicative cue. The alphas were .88 for the give me gesture, 1.00 for the reach gesture, and .92 for the verbal request. After reliability coding was completed, in cases of disagreement, the primary author's code was used.

Results

Infants' Requests for Help

All infants were engaged (i.e., did not passively hold the object or picked up the object) in this task. As previously mentioned, few infants specifically named an object (i.e., "baba") or

person (i.e., “mama”; *n*=1), or engaged in alternating gaze cues (exact number indeterminable, see note in study limitations), so these cues were not included in analyses. Almost all infants used verbal expressions (*n*=32), and most infants indicated their need (*n*=26), and/or used a reaching grasp (*n*=20). Only 7 infants used internal state and one infant did not use any communicative cues to elicit help. Most infants (*n*=17) used three different communicative cues, while 12 used two, 3 used four, and 1 used one or none throughout the duration of the task. A complete breakdown of the communicative cues used by infants can be found in Table 2.

Infants’ Responses to and Mothers’ Requests for Help

Overall, 30 out of 34 infants were engaged (i.e., made contact with the dropped object) in the mother-focused out of reach task. Of the 30 infants that engaged with the task, 15 infants handed the object to their mother and 15 infants did not. There were no significant differences between infants that completed handover and those that did not in terms of gender ($t(32)=.404$, $p=.699$, $M_{males}=.714$, $SD=.717$, $M_{females}=.615$, $SD=.650$)) and age (i.e., in days) was not correlated with handover ($r(32)=.121$, $p=.494$). Mothers whose infants were engaged in the task most frequently used a reaching grasp (*n*=20) and/or verbal request (*n*=19). 11 mothers used the give me gesture and 3 did not use any gestures. 9 mothers used one cue, while 13 used two, 5 used three, and 3 used none. A one-way ANOVA revealed that there was no significant difference in infant handover success based on the number of cues mothers used ($F(3, 26)= .940$, $p = .435$). See Table 3 for communicative cue frequencies and patterns.

Infants’ Requests for Help Compared to Responses

Infants that completed the handover in the mother-focused task (*n*=15) produced the same number of cues in the infant-focused task as their unsuccessful counterparts (*n*=15). However, there were some significant differences in the types of communicative cues these infants used

(*see Figure 1)*. Infants that did handover the object to their mother were significantly more likely to produce the "reaching grasp" gesture (M=.80, SD=.41) than their unsuccessful counterparts (M=.33, SD=.49; $t(28) = 2.8$, $p = .009$). There was no significant difference between each groups' exposure to reaching grasps by their mothers in the mother-focused task ($t(28)$=-.756, p=.228; $M_{\text{successful}}$=.60, $SD_{successful}$=.51, $M_{\text{unsuccessful}}$=.73, $SD_{successful}$=.46 .

Discussion

This study is the first known work to observe infants' spontaneous requests for help in a naturalistic setting. First, we hoped to observe any communicative cues infants use to elicit instrumental helping from their mothers. We found that 33 out of 34 infants in our study used at least one communicative cue to elicit help from their mothers, with most using two to three unique cues. Infants most frequently used verbal expressions, indications of need, reaching grasps, and expressions of changes in internal state. Infants rarely used specific naming of either the desired object or of their mother who could meet their need. Few incidences of specific naming is likely because of infants' language development at 10 months as most infants used other developmentally appropriate vocalizations throughout the task. Although we noted some use of infants' alternating gaze, the technological limits of our study prevent us from commenting on the true frequency of this cue.

Secondly, we aimed to determine whether infants who successfully responded to their mothers' requests for help produced similar cues compared to their unsuccessful counterparts. Interestingly, infants that successfully handed an object to their mothers were significantly more likely to use a reaching grasp gesture than their unsuccessful peers. Importantly, this finding cannot be explained by mere exposure to this cue by their mothers, as there were no significant differences between groups in terms of their exposure to this communicative cue by their

mothers. Other researchers have identified that reaching can be a precursor to pointing, and that pointing may develop out of infants' failed attempts to reach a desired object (Carpendale & Carpendale, 2010). They also highlight that as infants' failed reaches lead to actions by their caregivers, these reaches can develop and be used by the infant to indicate a request, and in time, develop into informative pointing, which is a more sophisticated form of instrumental helping.

In addition to our expected findings, we also observed similarities between the communicative cues infants use to those that mothers use. Both infants and their mothers frequently used developmentally appropriate forms of verbal expressions and reaching grasps to elicit help from each other. Both mothers and infants also frequently used more than one communicative cue to elicit help. It is important to note that the coding schemes differed somewhat for mothers and infants because the categories do not allow for developmental differences between infants and their mothers (i.e., infants at 10 months can not give a specific verbal request). This means that although we can compare similarities between mothers' and infants' use of gestures, some categories are more directly related than others, and this is a limitation of this study.

We also found that the communicative cues infants use to elicit help from others are similar to those used in experimental settings. We applied a coding scheme adapted from standardised communicative cues used by researchers in previous studies (i.e., Svetlova et al., 2010), and found that infants produce similar cues. Infants frequently use verbal cues to attempt to direct the attention of others, whether indirectly indicating they have a need (i.e., babbling without indicating in some way who or what could meet that need), or directly verbally expressing their need (i.e., babbling while looking toward or reaching towards someone who could meet their need or directing attention towards the object of desire itself). Although infants

indicate changes in internal state and use a reaching grasp, they rarely do so without also engaging in some form of verbal communication at some point.

Although infants use similar communicative cues as researchers in structured experimental tasks, how they use these cues differs. Whereas researchers tend to use a prescribed sequence of indirect cues that progress towards more directive cues, infants almost always use directive cues that involve some form of verbal component (i.e., banging a tray, babbling, crying). Infants also direct their cues either directly towards the desired object or towards the person who could help them obtain the desired object, which differs from experimenters who tend to direct their cues towards the desired object or problem situation initially, and progress towards presenting cues to the individual who could solve the problem only if object directed cues were unsuccessful.

Overall, we applied an approach to understanding infant instrumental helping that transcends the typical constraints of the nativist-socialization debate. By conceptualizing infants as active agents that can develop action-patterns with others, we considered the co-action of natural development and early socialization on the development of early prosocial behaviour (Allen and Bickhard, 2013; Carpendale et al., 2021). This approach brings together previous work that has identified the contribution of infants' physical development (Libertus & Violi, 2016) and their social experiences with others (Carpendale et al., 2021; de Barbaro et al., 2013) to make way for researchers to shift the focus from how infants respond to the world around them towards how infants themselves interact with the world to solve their own problems in everyday situations.

Future research should consider how infants' communicative cues in problem solving situations may differ based on the context of the situation; Whether taking place in a familiar

environment (i.e., their home) with people they know (i.e., a parent) or in an unusual context (i.e., the laboratory), with people they are unfamiliar with (i.e., experimenters). Research may also consider how infants attempt to elicit help from others across other domains of prosocial behaviour (i.e., sharing). Our research was limited in some ways due to the remote nature of the work. Eye gaze for both mothers and infants was difficult to observe virtually, and future studies could improve upon this by employing eye-tracking technology. Although we requested similar objects and seating arrangements from participants, there was some variability in items used. Finally, due to the naturalistic setting of this experiment, some factors were beyond our control and may have added variability to our findings (i.e., presence of other children, noise in the home, pets).

Conclusion

This study found that infants produce communicative cues to elicit help from others in problem-based instrumental helping situations. These communicative cues are similar to those spontaneously produced by their mothers and those that are used in experimental tasks by researchers. We also found that infants who successfully respond to others' requests for help are significantly more likely to produce a reaching grasp in their own requests for help. We provide evidence that supports that infants are active agents who build on previous experiences to solicit help from others when faced with a problem they cannot solve independently (Carpendale et al., 2021; Dahl et al., 2021b). This research further advances the field by reversing standard methods of observing prosocial behaviour development in infants and shifting the question of instrumental helping from "how do infants *respond* to requests for instrumental help from others?" to "how do infants *request* instrumental help from others?".

Table 1

Coding scheme for infants' communicative cues in an out-of-reach task

Communicative Cue	Descriptor
Indication of Need	Facial/ bodily/ vocal expression of general need (noises, gestures, banging tray), not directed to a specific object or person
Internal State Expression	Internal State (i.e., pouts, shows frustration, cries) not directed to a specific object or person.
Verbal Expression	Verbal expression of a general need for an object (i.e., cries, yells) with direction towards a specific object or person
Naming specific object that would meet need	Names specific object or person (i.e., "toy" "baba", "mama" etc.)
Alternating Gaze	Alternating gaze between object and caregiver
Reaching/ Gesturing	Reach and gesture toward object or person (i.e., reaches, nods, strains)

Table 2

Infants' communicative cues in the infant-focused out of reach task

	Single Cue				Two Cues						Three Cues				Four Cues	
Cue Combination Used	N[a]	S[b]	V[c]	R[d]	NS	NV	NR	SV	SR	VR	NSV	NSR	NVR	SVR	NSVR	None
# of Infants	1	-	-	-	-	8	-	1	-	3	3	-	11	3	3	1
Total Individual Cue Use	26		10	32	20	-	-	-	-	-	-	-	-	-	-	-

Note.
[a]N=Indication of Need
[b]S= Internal State
[c]V=Verbal Expression
[d]R=Reaching Grasp

Table 3

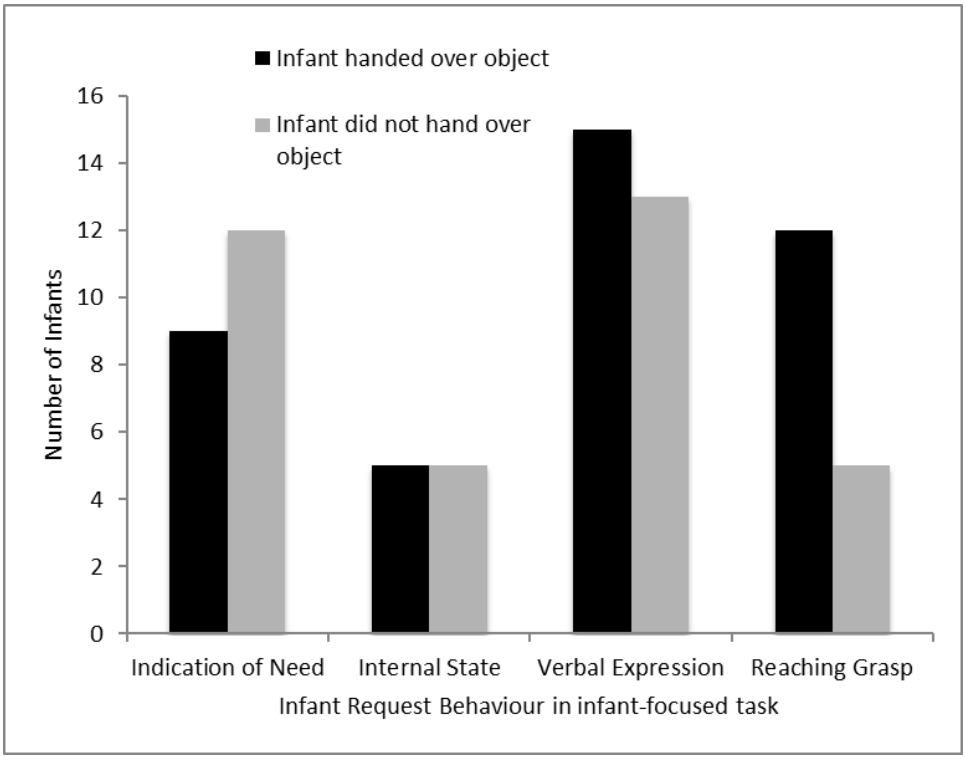
Mothers' communicative cues and infants' responses in the mother-focused out of reach task

	Single Cue			Two Cues			Three Cues	
Behaviours & Responses	Give Me (GM)	Reaching Grasp (RG)	Verbal Request (V)	GM & RG	GM &V	RG & V	GM, RG & V	None
Infant handed over object	-	4	1	-	2	3	4	1
Infant did not hand over object	1	2	1	1	2	5	1	2
Total	1	6	2	1	4	8	5	3

Note. 4 infants were disengaged in the task and are not included here.

Figure 1

Infants' Request Communicative Cues and Responses to Mothers' Request Communicative Cues



Note. **p=009

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Chapter 4: General Discussion & Conclusion

The development of prosocial behaviour in infants: The role of participating with, problem solving for, and requesting help from caregivers in the first year of life

General Discussion

Early infancy has been described as the next frontier for developmental research (Lapsley & Carlo, 2014) and moral developmentalists have since tackled this frontier by exploring the emergence and development of prosocial behaviour in infancy. The present thesis contributed to expanding that frontier by examining a different aspect of the socialization of instrumental helping (Study 1) and infants' own experiences when requiring prosocial behaviour from others (Study 2). We move now to a review of the main contributions of each of the studies presented in this thesis and the implications of this work on theory and research practice.

Main Contributions of Study 1

Study 1 examined mothers' communicative cues in object-return tasks that involve problem solving and participation. Typically, researchers have exclusively examined the socialization of instrumental helping using a *problem-solving* approach to their work, which focuses on observing behaviours in infants that are similar to those observed in older children and adults. Unfortunately, instances where adults require the help of an infant are rare and when they do happen, infants are limited in what they can do because of their physical development (Warneken & Tomasello, 2006; Libertus & Violi, 2016). Thus, most instances of infant problem solving have been observed in contrived laboratory experiments conducted with infants who have achieved locomotion. Largely distinct from the research on problem solving, researchers have examined infants' *participation* in everyday activities in the home (Hammond et al., 2017; Rheingold, 1982). This research paradigm observes infants' behaviours in their naturalistic environment and considers how infants work with their caregivers to accomplish everyday tasks (i.e., bathing, feeding, household chores). By observing infants in their natural environment, and in activities they participate in every day, participatory research addresses the rarity of opportunities for infants to help their caregivers and reduces the need for locomotion. Thus, the

primary contribution of Study 1 is the application of the approaches used commonly in research on infant problem solving to participation.

In Study 1, the spontaneous behaviours mothers use to elicit a hand over from their infants at 5, 8, and 10 months in participatory and problem-solving tasks were observed. Across tasks and time, mothers most frequently produced specific verbal requests, “give me” gestures, and reaching grasps. Mothers also typically used more than one communicative cue, and most frequently used a combination of three cues; Namely, a specific verbal request, “give me” gesture, and reaching grasp. Mothers who used a combination of all three cues were also more successful at eliciting a handover from their infants in both participation and problem-solving situations. The main observed difference between tasks was that mothers were less likely to attempt a handover in problem solving tasks than in participation tasks, especially at 5-months. Finally, it was observed that these spontaneously produced behaviours were found to be similar to those used by experimenters in structured laboratory-based experiments.

Study 1 builds on previous studies that have also documented some of the spontaneously produced behaviours caregivers use in everyday activities in the home. Carpendale and colleagues (2021) completed a diary study with infants, toddlers, and their parents to observe interactions in the home, and de Barbaro and colleagues (2016) observed mother-infant interactions in free-play scenarios in the home. Both previous studies observed the spontaneous production of the “give me” gesture by caregivers. We added to these findings by providing additional evidence for the spontaneous production of the “give me” gesture, as well as evidence for the use of reaching grasps and verbal cues. Interestingly, the current literature supports the findings related to the variety of spontaneous gestures observed in our study in structured,

experimenter-focused contexts but lacks documented evidence of their occurrence in the home with caregivers.

A recent study that somewhat addresses this gap in the literature, conducted by Dahl and colleagues (2021), observed the impact of explicit scaffolding on the emergence of infant prosocial behaviour in the form of object handovers and participation in cleaning up (an everyday task). Over the course of 10 weekly home visits, these researchers employed a standardized set of communicative cues that included a non-contact gesture similar to the "give me" gesture and verbal cues (i.e., I can't reach the block, do you want to give it to me?) to try to elicit a handover from infants in structured participation and problem-solving activities with an experimenter. These researchers found that, over the course of 10 weeks, infants that were exposed to the standardized communicative cues by the experimenter (i.e., explicit scaffolding) were more likely to handover objects and participate in everyday activities (i.e., cleaning up) over time. Like the findings in our study, infants responded more successfully with age.

Taken together with the findings presented in Study 1, infants exposed to communicative cues that include a "give me" style gesture and verbal cue, are increasingly able to respond successfully to participation and problem-solving situations in the home. Their ability to do so successfully also increases with age, whether in a structured situation with an experimenter or in a semi-structured task with their caregiver. Further, it seems that infants' success may be facilitated by explicit scaffolding. What remains unclear is the degree of explicit scaffolding infants receive naturally through everyday interaction with their caregivers. Although we provide evidence that supports the exposure of infants to communicative cues in the home by their mothers, the overall exposure of infants to these cues in the home remains unknown.

Main Contributions of Study 2

Pushing beyond the findings of Study 1, Study 2 observed, for the first time, the spontaneous communicative cues infants use to elicit help from their mothers. I found that infants most frequently used an indication of need, verbal expression, and reaching grasp to elicit help from their mothers. They also typically used more than one communicative cue to elicit help from their mothers. We determined that infants that appropriately respond to their mothers' requests for help are significantly more likely to use a reaching grasp gesture when they request help for themselves than infants who do not respond to their mothers' requests. Overall, infants were found to use communicative cues similar to the spontaneous behaviours of their mother and those used in standardized research.

To my knowledge, Study 2 is the first in the field to approach infant problem solving by observing infants' spontaneous communicative cues to solicit help from others in the home. All other known infant prosocial behaviour research understands infant problem solving by observing the rare event in which an adult requires the assistance of an infant to solve a problem. These rare events are typically observed in contrived laboratory settings to observe how infants respond to others' requests for help. We presented that turning the standard approach of understanding problem solving towards infants is especially interesting, because it is widely accepted both anecdotally (ask any parent), and in the field, that from birth infants do in fact elicit help from caregivers (Dahl & Brownell, 2019). However, despite this widely accepted assumption, a research account of these communicative cues over time and how they may change or mirror those produced spontaneously by their caregivers has not been previously recorded in the prosocial behaviour field.

In sum, the present research provides more evidence for the current frontier of early infancy research and pushes into the next horizon by considering, for the first time, how infants

solicit help from others. The first study aimed to determine how mothers elicit help from their infants, and whether these spontaneously produced communicative cues mirror those used by researchers in laboratory-based experiments. It also observed infants' participation and problem-solving behaviours between 5-10 months of age. The second study pushed further to consider whether infants, when faced with a problem situation requiring the instrumental help of another, solicit help from their mothers and what these solicitations might look like. This study also questioned whether the communicative cues infants produce (if any) are similar to those spontaneously produced by their mothers and to those used in laboratory-based experiments. If these hypotheses were true, then an account of the communicative cues infants are exposed to in problem-based situations could be provided, the communicative cues infants themselves produce in problem-solving situations could be described for the first time, and the validity of structured communicative cues used in experimental procedures in the lab could be evaluated.

Implications on Theory and Research

One of the major theoretical arguments in the moral development field involves whether infant prosocial behaviours emerge naturally, are socialized, or whether there is a co-action of biological and social factors. The present work, and especially the findings of Study 2, provide more support for a co-action of biological and social factors in the development of prosocial behaviours in infants. By turning standard research practices to focus on infants' requests for help, I observed that infants have developed action patterns that they use with their mothers to get help from them. For example, the communicative cues used by mothers and infants were similar in kind (i.e., verbal, reaching grasps) and in use (i.e., most mothers and infants used more than one communicative cue to elicit help from each other). Mother-led action-patterns were also observed to become more sophisticated as infants aged (i.e., transitioning from direct cues like a

reaching grasp to more general cues like the “give me” gesture). Taken together, these findings provide additional support for the co-action of infants’ sensorimotor development and socialization on infants’ development of prosocial behaviour.

Early patterns of spontaneous communicative cues between mothers and their infants have also been observed in other research. Developed “give me” gesture-based action-patterns have been observed in the home in giving exchanges (Carpendale et al., 2021), and in free-play based object exchanges (de Barbaro et al., 2016). Infants have also been observed to make anticipatory adjustments in response to mothers outstretched arms to facilitate being picked up as young as 2 months of age (Reddy et al., 2013) and infants as young as 8-months of age arch their backs to facilitate having their diaper changed (Hammond et al., 2017). Evidently, there is significant evidence for early-developing, diverse, and frequently used action patterns between infants and caregivers in the home.

In terms of biological implications on infants’ developing action patterns, there is significant evidence that physical development plays an important role in prosocial development. The findings presented here, in conjunction with findings from other research, suggests that these developed action-patterns become more successful and complex as infants age (de Barbaro, 2016; Dahl et al., 2021; thesis Study 1). One can infer that, as infants become more physically developed, their ability to respond to others and to initiate interactions with others improves and becomes more complex, thus facilitating successful responses to requests for and solicitations for help.

Further supporting the findings presented in this thesis and in recent literature, Dahl and colleagues (2023) have also further explored the development of morality with a complementary approach that combines a constructivist (as previously described) and interactionist framework.

In the interactivist framework, everyday interactions are thought to be largely sufficient for the development of prosocial behaviour, including problem solving which may rarely occur in everyday interaction in the case of infants' solving the problems of adults (although may frequently occur in the case of parents solving infants' problems). This complementary approach considers the complexity of biological, social, and psychological factors impacting development, while adding the active role (i.e., constructivist) infants have in the interaction-rich environments around them (i.e., in the home with caregivers). This view emphasizes the active contributions that infants make to their moral development as they develop action-patterns with caregivers through the initiation of interactions, reactions, and responses in their naturalistic environment. This complementary view is observed in and supported by the work presented in this thesis. Like Dahl and colleagues (2023) describe, we found that mothers consistently produce common cues to initiate behaviours in everyday interactions, and that as infants age, they too produce common cues to initiate responses from their mothers in the home. Through both conceptual and empirical advances, it is becoming increasingly clear that researchers should consider the impact that early and consistent interactions in the home have on the emergence and development of moral behaviour in infants.

In addition to the theoretical implications of the presented research, several implications for research practices emerged. Firstly, the findings of these studies provide more support for early observation of infant prosocial behaviour in the home and provide evidence for a renewed call for the study of participation. It is increasingly clear in the literature that early prosocial behaviour can be observed in very young infants when they are observed in the home in participation-based everyday activities (Hammond et al., 2017; Carpendale et al., 2021). Moreover, by observing infants in their naturalistic environment and during interactions with

caregivers instead of experimenters, researchers can reduce the impact of novelty or strangeness on behaviour. Eliminating "newness" may allow for a purer sample of behaviour that mirrors what occurs in natural, everyday situations.

Secondly, experimenters should consider modifying the communicative cue structure currently used in the experimental literature to better mirror the spontaneously produced communicative cues observed in both mothers and infants. Although many of the behaviours observed in the presented work are also used in structured experiments, the order of cue presentation varied from laboratory-based experiments and some cues used in structured lab-based experiments do not appear at all in naturalistic settings. Study 1 demonstrated that mothers use more than one communicative cue simultaneously when attempting to elicit help from their infants. We also observed that some cues used in experimental procedures are simply not used by mothers in naturalistic settings. Thus, some of the cues used exclusively in laboratory-based experiments (i.e., indication of need, internal state) may be considered unusual and meaningless to infants because they may have had limited exposure to those communicative cues outside of the experimental context Given that structured studies use a specific cue structure to elicit infant response with increasingly more directive cues, the findings from this work suggests which cues infants are actually exposed to in the naturalistic environment and how these communicative cues should be presented to infants in problem-solving situations.

Thirdly, this thesis provides a different angle to the study of infant problem solving. Unlike past research on problem solving, which stresses the rarity of infant problem solving because adults rarely require the help of an infant, we present that it is reasonable to assume that infants often require others' assistance, and that there is a richness to observing problem solving from the infants' perspective. Presently, there is a distinct gap in the literature pertaining to the

field's understanding of how infants themselves request help from others when faced with a problem situation. Up to this point, infant prosocial development research has almost exclusively focused on infants' production of prosocial behaviour. Little is known about how infants' early experiences of others' prosocial behaviour, whether in the home or broader community, relates to their own prosocial development overtime. This shift in focus may allow the field to broaden its understanding of the potential influence of biological development, socialization, cultural differences in emergence, and give rise to early interventions to promote prosocial development in infants and young children.

Limitations

Although the presented work provided significant insight into the early development of participation and problem solving in infants, there are some limitations to the findings. First, given the remote nature of the study, it was not possible to standardize the environments in all situations, despite experimenters' best efforts. For example, at times, especially at the beginning of the COVID-19 pandemic, other children, adults, and animals were sometimes present during the testing sessions. Additionally, not all participants had identical supplies available to them (i.e., highchair, bumbo, stroller). Future work, if completed remotely, could supply families with identical items and more strictly limit the presence of other individuals/ animals in the testing environment.

In terms of observable behaviours, it became apparent that we could not reliably observe alternating eye gaze in our experiments. It is possible that infants and their mothers use eye gaze to direct attention and/or request help more often than we were able to discern. Future work could consider the use of eye tracking technology to better understand the use of eye gaze to elicit participation and problems solving from others.

Finally, although all participants had the proper technology to participate in the study (i.e., telemetric device with microphone, camera, and internet capabilities), there were distinct challenges with internet quality that were experienced. For example, internet connections were at times “unstable” causing connections to cease mid-task, “laggy” resulting in a delay in recordings and missed moments, and sometimes testing sessions needed to be rescheduled altogether. These issues resulted in omitted data points for certain tasks or ages for some participants, and ultimately reduced the amount of usable data. In the future, participants could be provided with a portable wi-fi hotspot that would provide reliable internet access for testing sessions.

Conclusion

Infants and their mothers spontaneously produce communicative cues to elicit participation and problem solving from one another. These behaviours are observed in the naturalistic environment of the home and are also similar to those used in structured experimental procedures. Despite the findings presented here, there remains much to explore with respect to the relationship between the prosocial behaviours and requests for help infants are exposed to and their own production of these behaviours. As the field continues to forge ahead, beyond the frontiers of early infancy, and now towards the horizon of infant directed prosocial behaviour, it is clear that we have much more to learn from the youngest of our kind.

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Appendix A

Demographic and Social Measures

Demographics

What is your name? (First and Last)

_____

What is your child's name?

_____

What province or territory do you currently reside in?

- Alberta
- British Columbia
- Manitoba
- New Brunswick
- Newfoundland and Labrador
- Northwest Territories
- Nova Scotia
- Nunavut
- Ontario
- Prince Edward Island
- Quebec
- Saskatchewan
- Yukon

What is your child's date of birth (DAY, MONTH, YEAR)?

_____

What is this child's gender?

- Male
- Female

I am this child's

- Mother
- Father
- Other (please specify) _____

How many children (under 18 years) live in the home including this child?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8+

Does this child have any siblings living at home?

- # older siblings _____
- # same-age siblings _____
- # younger siblings _____

How many adults (18 years +) live in the home including yourself?

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8+

How many pets live in the home?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8+

What kind of pets live in the home (e.g., dogs; cats)?

_____

_____

_____

_____

_____

Does this child attend daycare?

- Yes _____
- No

Approximately how many hours per average week does this child attend daycare?

_____

Does this child watch TV, computers, or play video games?

- Yes _____
- No

Approximately how many hours per average week does this child watch TV, computers, or play video games?

_____

Please describe this child's race/ethnicity [click as many as apply]

- North American Aboriginal (First Nations, Inuit, or Métis)
- Other North American
- European
- Caribbean
- Latin, Central or South American
- Black or African American
- Asian or Pacific Islander
- Other (Please specify) _____

What languages are spoken in the home (i.e., used for day-to-day conversation) [click as many as apply]

- English
- French
- Arabic
- Mandarin Chinese
- Cantonese Chinese
- Italian
- Spanish
- German
- Punjabi
- Dutch
- Tagalog
- Other (Please specify) _____

What is your religion? [specify one denomination or religion]

- Religion _____
- No religion

What is the highest level of schooling this child's parent(s) have received?

- Less than high school degree
- High school degree or equivalent (e.g., GED)
- Some university or college but no degree
- College diploma
- Bachelor degree
- Graduate degree

What is your approximate average household income?

- $0-$24,999
- $25,000-$49,999
- $50,000-$99,999
- $100,000-$149,999
- $150,000-and up

Social Development Measure: ASQ-3 (5 Months)

Does your baby make high pitched squeals?
- Yes
- Sometimes
- Not Yet

When playing with sounds, does your baby make grunting, growling, or other deep-toned sounds?
- Yes
- Sometimes
- Not Yet

If you call your baby when you are our of sight, does she look in the direction of your voice?
- Yes
- Sometimes
- Not Yet

When a loud noise occurs, does your baby turn to see where the sound came from?
- Yes
- Sometimes
- Not Yet

Does your baby make sounds like "da," "ga," "ka," and "ba"?
- Yes
- Sometimes
- Not Yet

If you copy the sounds your baby makes, does your baby repeat the same sounds back to you?
- Yes
- Sometimes
- Not Yet

While your baby is on his back, does your baby lift his legs high enough to see his feet?

- Yes
- Sometimes
- Not Yet

When your baby is on her tummy, does she straighten both arms and push her whole chest off the bed or floor?

- Yes
- Sometimes
- Not Yet

Does your baby roll from his back to his tummy, getting both arms out from under him?

- Yes
- Sometimes
- Not Yet

When your baby is on the floor does she lean on her hands while sitting? (if she already sits up straight without leaning on her hands, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

If you hold both hands just to balance your baby, does he support his own weight while standing?

- Yes
- Sometimes
- Not Yet

Does your baby get into a crawling position by getting up on her hands and knees?

- Yes
- Sometimes
- Not Yet

Does your baby grab a toy you offer and look at it, wave it about, or chew on it for about 1 minute?

- Yes
- Sometimes

- Not Yet

Does your baby reach for or grasp a toy using both hands at once?
- Yes
- Sometimes
- Not Yet

Does your baby reach for a crumb or cheerio and touch it with his finger or hand?(if he already picks up a small object the size of a pea, mark "yes" for this item.)
- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy, holding it in the center of her hand with her fingers around it?
- Yes
- Sometimes
- Not Yet

Does your baby try to pick up a crumb or Cheerio by using his thumb and all of his fingers in a raking motion, even if he isn't able to pick it up? (if he already picks up the crumb or Cheerio, mark "yes" for this item.)
- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with only one hand?
- Yes
- Sometimes
- Not Yet

When a toy is in front of your baby, does she reach for it with both hands?
- Yes
- Sometimes
- Not Yet

When your baby is on his back, does he turn his head to look for a toy when he drops it? (If he already picks it up, mark "yes" for this item.)
- Yes
- Sometimes
- Not Yet

When your baby is on her back, does she try to get a toy she has dropped if she can see it?
- Yes
- Sometimes
- Not Yet

Does your baby pick up a toy and put it in his mouth?
- Yes
- Sometimes
- Not Yet

Does your baby pass a toy back and forth from one hand to the other?
- Yes
- Sometimes
- Not Yet

Does your baby play by banging a toy up and down on the floor or table?
- Yes
- Sometimes
- Not Yet

When in front of a large mirror, does your baby smile or coo at herself?
- Yes
- Sometimes
- Not Yet

Does your baby act differently toward strangers than he does with you and other familiar people? (Reactions to strangers may include staring, frowning, withdrawing, or crying.)
- Yes
- Sometimes

- Not Yet

While lying on her back, does your baby play by grabbing her foot?
- Yes
- Sometimes
- Not Yet

When in front of a large mirror, does your baby reach out to pat the mirror?
- Yes
- Sometimes
- Not Yet

While your baby is on his back, does he put his foot in his mouth?
- Yes
- Sometimes
- Not Yet

Does your baby try to get a toy that is out of reach? (She may roll, pivot on her tummy, or crawl to get it.)
- Yes
- Sometimes
- Not Yet

ASQ-3 (6 Months)

Does your baby make high pitched squeals?
- Yes
- Sometimes
- Not Yet

When playing with sounds, does your baby make grunting, growling, or other deep-toned sounds?
- Yes
- Sometimes
- Not Yet

If you call your baby when you are our of sight, does she look in the direction of your voice?

- Yes
- Sometimes
- Not Yet

When a loud noise occurs, does your baby turn to see where the sound came from?

- Yes
- Sometimes
- Not Yet

Does your baby make sounds like "da," "ga," "ka," and "ba"?

- Yes
- Sometimes
- Not Yet

If you copy the sounds your baby makes, does your baby repeat the same sounds back to you?

- Yes
- Sometimes
- Not Yet

While your baby is on his back, does your baby lift his legs high enough to see his feet?

- Yes
- Sometimes
- Not Yet

When your baby is on her tummy, does she straighten both arms and push her whole chest off the bed or floor?

- Yes
- Sometimes
- Not Yet

Does your baby roll from his back to his tummy, getting both arms out from under him?

- Yes
- Sometimes
- Not Yet

When your baby is on the floor does she lean on her hands while sitting? (if she already sits up straight without leaning on her hands, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

If you hold both hands just to balance your baby, does he support his own weight while standing?

- Yes
- Sometimes
- Not Yet

Does your baby get into a crawling position by getting up on her hands and knees?

- Yes
- Sometimes
- Not Yet

Does your baby grab a toy you offer and look at it, wave it about, or chew on it for about 1 minute?

- Yes
- Sometimes
- Not Yet

Does your baby reach for or grasp a toy using both hands at once?

- Yes
- Sometimes
- Not Yet

Does your baby reach for a crumb or cheerio and touch it with his finger or hand?(if he already picks up a small object the size of a pea, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy, holding it in the center of her hand with her fingers around it?

- Yes
- Sometimes
- Not Yet

Does your baby try to pick up a crumb or Cheerio by using his thumb and all of his fingers in a raking motion, even if he isn't able to pick it up? (if he already picks up the crumb or Cheerio, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with only one hand?

- Yes
- Sometimes
- Not Yet

When a toy is in front of your baby, does she reach for it with both hands?

- Yes
- Sometimes
- Not Yet

When your baby is on his back, does he turn his head to look for a toy when he drops it? (If he already picks it up, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

When your baby is on her back, does she try to get a toy she has dropped if she can see it?

- Yes
- Sometimes
- Not Yet

Does your baby pick up a toy and put it in his mouth?

- Yes

- Sometimes
- Not Yet

Does your baby pass a toy back and forth from one hand to the other?
- Yes
- Sometimes
- Not Yet

Does your baby play by banging a toy up and down on the floor or table?
- Yes
- Sometimes
- Not Yet

When in front of a large mirror, does your baby smile or coo at herself?
- Yes
- Sometimes
- Not Yet

Does your baby act differently toward strangers than he does with you and other familiar people? (Reactions to strangers may include staring, frowning, withdrawing, or crying.)
- Yes
- Sometimes
- Not Yet

While lying on her back, does your baby play by grabbing her foot?
- Yes
- Sometimes
- Not Yet

When in front of a large mirror, does your baby reach out to pat the mirror?
- Yes
- Sometimes
- Not Yet

While your baby is on his back, does he put his foot in his mouth?

- Yes
- Sometimes
- Not Yet

Does your baby try to get a toy that is out of reach? (She may roll, pivot on her tummy, or crawl to get it.)

- Yes
- Sometimes
- Not Yet

ASQ-3 (7 Months)

If you call your baby when you are out of sight, does she look in the direction of your voice?

- Yes
- Sometimes
- Not Yet

When a loud noise occurs, does your baby turn to see where the sound came from?

- Yes
- Sometimes
- Not Yet

If you copy the sounds your baby makes, does your baby repeat the same sounds back to you?

- Yes
- Sometimes
- Not Yet

Does your baby make sounds like "da," "ga," "da-da," or "ga-ga" (The sounds do not need to mean anything).

- Yes
- Sometimes
- Not Yet

Does your baby respond to the tone of your voice and stop his activity at least briefly when you say "no-no" to him?

- Yes
- Sometimes
- Not Yet

Does your baby make two similar sounds like "ba-ba," "da-da," or "ga-ga"? (The sounds do not need to mean anything.)

- Yes
- Sometimes
- Not Yet

When you put your baby on the floor, does she lean on her hands while sitting? (If she already sits up straight without leaning on her hands, mark "yes" for this item).

- Yes
- Somtimes
- Not Yet

Does your baby roll from his back to his tummy, getting both arms out from under him?

- Yes
- Sometimes
- Not Yet

Does your baby get into a crawling position by getting up on her hands and knees?

- Yes
- Sometimes
- Not Yet

If you hold both hands just to balance your baby, does he support his own weight while standing?

- Yes
- Sometimes
- Not Yet

When sitting on the floor, does your baby sit up straight for several minutes without using her hands for support?

- Yes
- Sometimes
- Not Yet

When you stand your baby next to furniture or the crib rail, does he hold on without leaning on his chest against the furniture for support?

- Yes
- Sometimes
- Not Yet

Does your baby reach for a crumb or Cheerio and touch it with her finger or hand? (If she already picks up a small object, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy, holding it in the center of his hand with his fingers around it?

- Yes
- Sometimes
- Not Yet

Does your baby try to pick up a crumb or Cheerio by using her thumb and all of her fingers in a raking motion, even if she isn't able to pick it up? (If she already picks up a crumb or cheerio, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with only one hand?

- Yes
- Sometimes
- Not Yet

Does your baby successfully pick up a crumb or Cheerio by using his thumb and all of his fingers in a raking motion? (If he already picks up a crumb or Cheerio, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with the tips of her thumb and fingers? (You should see a space between the toy and her palm.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a toy and put it in his mouth?

- Yes
- Sometimes
- Not Yet

When your baby is on her back, does she try to get a toy she has dropped if she can see it?

- Yes
- Sometimes
- Not Yet

Does your baby play by banging a toy up and down on the floor or table?

- Yes
- Sometimes
- Not Yet

Does your baby pass a toy back and forth from one hand to the other?

- Yes
- Sometimes
- Not Yet

Does your baby pick up two small toys, one in each hand, and hold onto them for about 1 minute?

- Yes
- Sometimes
- Not yet

When holding a toy in his hand, does your baby bang it against another toy on the table?

- Yes
- Sometimes

- Not Yet

When lying on her back, does your baby play by grabbing her foot?
- Yes
- Sometimes
- Not Yet

When in front of a large mirror, does your baby reach out to pat the mirror?
- Yes
- Sometimes
- Not Yet

Does your baby try to get a toy that is out of reach? (He may roll, pivot on his tummy, or crawl to get it.)
- Yes
- Sometimes
- Not Yet

While your baby is on her back, does she put her foot in her mouth?
- Yes
- Sometimes
- Not Yet

Does your baby drink water, juice, or formula from a cup while you hold it?
- Yes
- Sometimes
- Not Yet

Does your baby feed himself a cracker or a cookie?
- Yes
- Sometimes
- Not Yet

ASQ-3 (8 Months)

If you call your baby when you are out of sight, does she look in the direction of your voice?
- Yes

- Sometimes
- Not Yet

When a loud noise occurs, does your baby turn to see where the sound came from?
- Yes
- Sometimes
- Not Yet

If you copy the sounds your baby makes, does your baby repeat the same sounds back to you?
- Yes
- Sometimes
- Not Yet

Does your baby make sounds like "da," "ga," "da-da," or "ga-ga" (The sounds do not need to mean anything).
- Yes
- Sometimes
- Not Yet

Does your baby respond to the tone of your voice and stop his activity at least briefly when you say "no-no" to him?
- Yes
- Sometimes
- Not Yet

Does your baby make two similar sounds like "ba-ba," "da-da," or "ga-ga"? (The sounds do not need to mean anything.)
- Yes
- Sometimes
- Not Yet

When you put your baby on the floor, does she lean on her hands while sitting? (If she already sits up straight without leaning on her hands, mark "yes" for this item).
- Yes
- Somtimes

- Not Yet

Does your baby roll from his back to his tummy, getting both arms out from under him?
- Yes
- Sometimes
- Not Yet

Does your baby get into a crawling position by getting up on her hands and knees?
- Yes
- Sometimes
- Not Yet

If you hold both hands just to balance your baby, does he support his own weight while standing?
- Yes
- Sometimes
- Not Yet

When sitting on the floor, does your baby sit up straight for several minutes without using her hands for support?
- Yes
- Sometimes
- Not Yet

When you stand your baby next to furniture or the crib rail, does he hold on without leaning on his chest against the furniture for support?
- Yes
- Sometimes
- Not Yet

Does your baby reach for a crumb or Cheerio and touch it with her finger or hand? (If she already picks up a small object, mark "yes" for this item.)
- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy, holding it in the center of his hand with his fingers around it?

- Yes
- Sometimes
- Not Yet

Does your baby try to pick up a crumb or Cheerio by using her thumb and all of her fingers in a raking motion, even if she isn't able to pick it up? (If she already picks up a crumb or cheerio, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with only one hand?

- Yes
- Sometimes
- Not Yet

Does your baby successfully pick up a crumb or Cheerio by using his thumb and all of his fingers in a raking motion? (If he already picks up a crumb or Cheerio, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with the tips of her thumb and fingers? (You should see a space between the toy and her palm.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a toy and put it in his mouth?

- Yes
- Sometimes
- Not Yet

When your baby is on her back, does she try to get a toy she has dropped if she can see it?
- Yes
- Sometimes
- Not Yet

Does your baby play by banging a toy up and down on the floor or table?
- Yes
- Sometimes
- Not Yet

Does your baby pass a toy back and forth from one hand to the other?
- Yes
- Sometimes
- Not Yet

Does your baby pick up two small toys, one in each hand, and hold onto them for about 1 minute?
- Yes
- Sometimes
- Not yet

When holding a toy in his hand, does your baby bang it against another toy on the table?
- Yes
- Sometimes
- Not Yet

When lying on her back, does your baby play by grabbing her foot?
- Yes
- Sometimes
- Not Yet

When in front of a large mirror, does your baby reach out to pat the mirror?
- Yes
- Sometimes
- Not Yet

Does your baby try to get a toy that is out of reach? (He may roll, pivot on his tummy, or crawl to get it.)

- Yes
- Sometimes
- Not Yet

While your baby is on her back, does she put her foot in her mouth?

- Yes
- Sometimes
- Not Yet

Does your baby drink water, juice, or formula from a cup while you hold it?

- Yes
- Sometimes
- Not Yet

Does your baby feed himself a cracker or a cookie?

- Yes
- Sometimes
- Not Yet

ASQ-3 (9 Months)

Does your baby make sounds like "da," "ga," "ka," and "ba"?

- Yes
- Sometimes
- Not Yet

If you copy the sounds your baby makes, does your baby repeat the same sounds back to you?

- Yes
- Sometimes
- Not Yet

Does your baby make two similar sounds like "ba-ba," "da-da," or "ga-ga"? (The sounds do not have to mean anything.)

- Yes
- Sometimes

- Not Yet

If you ask your baby to, does he play at least one nursery game even if you don't show her the activity yourself (such as "bye-bye," "Peekaboo," "clap your hands," "So Big")?

- Yes
- Sometimes
- Not Yet

Does your baby follow one simple command, such as "Come here," "Give it to me," or "Put it back," without your using gestures?

- Yes
- Sometimes
- Not Yet

Does your baby say three words, such as "Mama," "Dada," and "Baba,"? (A "word" is a sound or sounds your baby says consistently to mean someone or something.)

- Yes
- Sometimes
- Not Yet

If you hold both hands just to balance your baby, does she support her own weight while standing?

- Yes
- Sometimes
- Not Yet

When sitting on the floor, does your baby sit up straight for several minutes without using his hands for support?

- Yes
- Sometimes
- Not Yet

When you stand your baby next to furniture of the crib rail, does she hold on without leaning on her chest against the furniture for support?

- Yes
- Sometimes

- Not Yet

While holding onto furniture, does your baby bend down and pick up a toy from the floor and then return to a standing position?

- Yes
- Sometimes
- Not Yet

While holding onto furniture, does your baby lower himself with control (without falling or flopping down)?

- Yes
- Sometimes
- Not Yet

Does your baby walk beside furniture while holding on with only one hand?

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with only one hand?

- Yes
- Sometimes
- Not Yet

Does your baby successfully pick up a crumb or Cheerio by using her thumb and all of her fingers in a raking motion? (If she already picks up a crumb or Cheerio mark "yes" for this item.

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with the tips of his thumb and fingers? (You should see a space between the toy and his palm.)

- Yes
- Sometimes
- Not Yet

After one or two tries, does your baby pick up a piece of string with her first finger and thumb? (The string may be attached to a toy.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a crumb or Cheerio with the tips of his thumb and a finger? He may rest his arm or hand on the table while doing it.

- Yes
- Sometimes
- Not Yet

Does your baby put a small toy down, without dropping it, and then take her hand off the toy?

- Yes
- Sometimes
- Not Yet

Does your baby pass a toy back and forth from one hand to the other?

- Yes
- Sometimes
- Not Yet

Does your baby pick up two small toys, one in each hand, and hold onto them for about 1 minute?

- Yes
- Sometimes
- Not Yet

When holding a toy in his hand, does your baby bang it against another toy on the table?

- Yes
- Sometimes
- Not Yet

While holding a small toy in each hand, does your baby clap the toys together (like "Pat-a-cake")?
- Yes
- Sometimes
- Not Yet

Does your baby poke at or try to get a crumb or Cheerio that is inside a clear bottle (such as plastic soda-pop bottle or baby bottle)?
- Yes
- Sometimes
- Not Yet

After watching you hide a small toy under a piece of paper or cloth, does your baby find it? (Be sure the toy is completely hidden.)
- Yes
- Sometimes
- Not Yet

While your baby is on her back, does she put her foot in her mouth?
- Yes
- Sometimes
- Not Yet

Does your baby drink water, juice, or formula from a cup while you hold it?
- Yes
- Sometimes
- Not Yet

Does your baby feed himself a cracker or cookie?
- Yes
- Sometimes
- Not Yet

When you hold out your hand and ask for her toy, does your baby offer it to you even if she doesn't let go of it? (If she already lets go of the toy into your hand, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

When you dress your baby, does he push his arm through a sleeve once his arm is started in the hole of the sleeve?

- Yes
- Sometimes
- Not Yet

When you hold out your hand and ask for her toy, does your baby let go of it into your hand?

- Yes
- Sometimes
- Not Yet

ASQ-3 (10 Months)

Does your baby make sounds like “da,” “ga,” “ka,” and “ba”?

- Yes
- Sometimes
- Not Yet

If you copy the sounds your baby makes, does your baby repeat the same sounds back to you?

- Yes
- Sometimes
- Not Yet

Does your baby make two similar sounds like “ba-ba,” “da-da,” or “ga-ga”? (The sounds do not need to mean anything.)

- Yes
- Sometimes
- Not Yet

If you ask your baby to, does he play at least one nursery game even if you don’t show him the activity yourself (such as “bye-bye,” “Peeka- boo,” “clap your hands,” “So Big”)?

- Yes
- Sometimes

- Not Yet

Does your baby follow one simple command, such as “Come here,” “Give it to me,” or “Put it back,” without your using gestures?

- Yes
- Sometimes
- Not Yet

Does your baby say three words, such as “Mama,” “Dada,” and “Baba”? (A “word” is a sound or sounds your baby says consistently to mean someone or something.)

- Yes
- Sometimes
- Not Yet

If you hold both hands just to balance your baby, does she support her own weight while standing?

- Yes
- Sometimes
- Not Yet

When sitting on the floor, does your baby sit up straight for several minutes without using his hands for support?

- Yes
- Sometimes
- Not Yet

When you stand your baby next to furniture or the crib rail, does she hold on without leaning her chest against the furniture for support?

- Yes
- Sometimes
- Not Yet

While holding onto furniture, does your baby bend down and pick up a toy from the floor and then return to a standing position?

- Yes
- Sometimes

- Not Yet

While holding onto furniture, does your baby lower himself with control (without falling or flopping down)?

- Yes
- Sometimes
- Not Yet

Does your baby walk beside furniture while holding on with only one hand?

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with only one hand?

- Yes
- Sometimes
- Not Yet

Does your baby successfully pick up a crumb or Cheerio by using her thumb and all of her fingers in a raking motion? (If she already picks up a crumb or Cheerio, mark “yes” for this item.)

- Yes
- Sometimes
- Not Yet

Does your baby pick up a small toy with the tips of his thumb and fingers? (You should see a space between the toy and his palm.)

- Yes
- Sometimes
- Not Yet

After one or two tries, does your baby pick up a piece of string with her first finger and thumb? (The string may be attached to a toy).

- Yes
- Sometimes
- Not Yet

Does your baby pick up a crumb or Cheerio with the tips of his thumb and a finger? He may rest his arm or hand on the table while doing it.

- Yes
- Sometimes
- Not Yet

Does your baby put a small toy down, without dropping it, and then take her hand off the toy?

- Yes
- Sometimes
- Not Yet

Does your baby pass a toy back and forth from one hand to the other?

- Yes
- Sometimes
- Not Yet

Does your baby pick up two small toys, one in each hand, and hold onto them for about 1 minute?

- Yes
- Sometimes
- Not Yet

When holding a toy in his hand, does your baby bang it against another toy on the table?

- Yes
- Sometimes
- Not Yet

While holding a small toy in each hand, does your baby clap the toys together (like “Pat-a-cake”)?

- Yes
- Sometimes
- Not Yet

Does your baby poke at or try to get a crumb or Cheerio that is inside a clear bottle (such as a plastic soda-pop bottle or baby bottle)?

- Yes
- Sometimes
- Not Yet

After watching you hide a small toy under a piece of paper or cloth, does your baby find it? (Be sure the toy is completely hidden.)

- Yes
- Sometimes
- Not Yet

While your baby is on her back, does she put her foot in her mouth?

- Yes
- Sometimes
- Not Yet

Does your baby drink water, juice, or formula from a cup while you hold it?

- Yes
- Sometimes
- Not Yet

Does your baby feed himself a cracker or a cookie?

- Yes
- Sometimes
- Not Yet

When you hold out your hand and ask for her toy, does your baby offer it to you even if she doesn't let go of it? (If she already lets go of the toy into your hand, mark "yes" for this item.)

- Yes
- Sometimes
- Not Yet

When you dress your baby, does he push his arm through a sleeve once his arm is started in the hole of the sleeve?

- Yes
- Sometimes
- Not Yet

When you hold out your hand and ask for her toy, does your baby let go of it into your hand?

- Yes
- Sometimes
- Not Yet

Appendix B

Study 1 Consent Form

Title of The Study: Infant helping in the first year of life.

The purpose of this research is to learn more about the development of cooperation and prosocial behaviour. My participation over the course of the study will consist of 1-2 brief visits per month over the next year. Those living in the Ottawa-Gatineau region will be invited to visit the Social Moral Development lab at the University of Ottawa for some of these visits. I will be asked again to fill-out a consent form before each visit with a specific description of tasks for that visit.

During this session, I will participate in the following types of tasks:

Questionnaires: Throughout the study I will be asked to fill-out questionnaires on my child's motor development, language, temperament, and behaviour in the home.

Anonymity will be assured in the following manner: the researchers will assign code to the study records, to render them anonymous the link between the codes and the study records will be kept in a separate, secured location the researchers will keep the videos and records for 10 years, stored in a secured location at the University researchers will not use my name or my child's name in any publications associated with the study Participation in this study is strictly voluntary, and my child and I are free to withdraw from the project at any time before or during the session, and to refuse to participate/answer in particular tasks/questions. If my child indicates that they no longer wish to participate (e.g., tired or frustrated), the researcher will stop the session. If I/my child choose/chooses to withdraw, data will be destroyed. Additionally, if I choose to withdraw from the study after my child has participated my data will be destroyed. There are no known risks for my child in these procedures and children typically have fun engaging in these types of "games" with the researcher.

Researchers will not use this name in any publications associated with the study. Researchers may include graduate and undergraduate student researchers, who may analyze the data for undergraduate and graduate theses and projects.

Your participation is voluntary, and you may withdraw from this project at any time before submitting your results. This study is being conducted by Dr. Stuart I. Hammond, School of Psychology, University of Ottawa, 613-562-5800 (ext. 4467), shammond@uottawa.ca. Any information about my rights as a research participant may be addressed to Protocol Officer for Ethics in Research, 550 Cumberland Street, Room 154, (613) 562-5387, or ethics@uottawa.ca

The funding for this research is sourced from the Social Sciences and Humanities Research Council (430-2017-00620)

To indicate your consent with the above statement, and to continue on to the survey, press the button below.

I Agree

Study 2 Consent Form

Title of the Study: Infant helping in the first year of life.

The purpose of this research is to learn more about the development of cooperation and prosocial behaviour. My participation over the course of the study will consist of 1brief visit per month over the next year. I will be asked again to fill-out a consent form before each visit with a specific description of tasks for that visit.

During this session, I will participate in the following types of tasks:
Questionnaires: Throughout the study I will be asked to fill-out questionnaires on my child's motor development, language, temperament, and behaviour in the home.

Anonymity will be assured in the following manner: the researchers will assign code to the study records, to render them anonymous the link between the codes and the study records will be kept in a separate, secured location the researchers will keep the videos and records for 10 years, stored in a secured location at the University researchers will not use my name or my child's name in any publications associated with the study.

Participation in this study is strictly voluntary, and my child and I are free to withdraw from the project at any time before or during the session, and to refuse to participate/answer in particular tasks/questions. If my child indicates that they no longer wish to participate (e.g., tired or frustrated), the researcher will stop the session. If I/my child choose/chooses to withdraw, data will be destroyed. Additionally, if I choose to withdraw from the study after my child has participated my data will be destroyed. There are no known risks for my child in these procedures and children typically have fun engaging in these types of "games" with the researcher.

Researchers will not use this name in any publications associated with the study. Researchers may include graduate and undergraduate student researchers, who may analyze the data for undergraduate and graduate theses and projects.
Your participation is voluntary, and you may withdraw from this project at any time before submitting your results.

This study is being conducted by Dr. Stuart I. Hammond, School of Psychology, University of Ottawa, 613-562-5800 (ext. 4467), shammond@uottawa.ca. Any information about my rights as a research participant may be addressed to Protocol Officer for Ethics in Research, 550 Cumberland Street, Room 154, (613) 562-5387, or ethics@uottawa.ca. The funding for this research is sourced from the Social Sciences and Humanities Research Council (430-2017-00620)

To indicate your consent with the above statement, and to continue on to the survey, press the button below.

I Agree

Appendix C

Study 1 Interview Scripts

Interview Script 5-6 Months

Introduction

(*If baby name known)* Hello _____ and _____

Thank you so much for meeting with us today, and thank you for filling out the questionnaire (or, I see that we don't have the questionnaire from you yet, if you can please complete this sometime today that would be great!). Did you have any questions about the consent form? Do you have any other questions for me/us before we get started today?

Orienting the Camera and Infant

- If the baby is not in full view of the camera say;
  - We would like to be able to see as much of your baby's body as we can, as well as, their face. Are you able to move the camera (up/down/ farther/ closer) or the baby (up/down/ farther/ closer)?
- If the Camera is on Portrait mode say;
  - Are you able to put the camera on portrait? If using a tablet/ iPad/ Phone you may have to put the device on its other side to make it landscape.

Task Introduction

Today I will ask you to do a few simple tasks with your baby. First, I will ask you to put a marker or similar sized and shaped object in your baby's hand, and have you try to get it back from them as you normally would. Second, I will ask you to put on your baby's sock and hat, leave them on for 10-15 seconds then remove them again. Third you will take their sock, drop it on their lap, say "Oops", leave it for 10-15 seconds, then get the sock back from them as you normally would. Lastly, I will ask you to play with your baby as you normally would for a few minutes and I will let you know when to stop.

While you are completing these tasks I will make our screen dark and will try not to make any noise so we don't distract you and your baby. We love babies, so its really hard for us to be quiet, but know we are still there and its really hard for us to be so silent because they are so cute!

I will tell you when to move on to the next task and am always there if you have any questions! Do you have any questions before we begin?

Marker Task

Okay, let's get started. First let's have you give a marker to your baby, then try to naturally get the marker back from your baby. My screen will be dark so I don't distract you or your baby, but I am still there. (Cover Camera and observe, end task if marker is retrieved from infant or after 2 minutes pass and the infant has not yet given the marker back.)

Thank you.

Clothing Task

Now, you can put on the hat and sock, leave it on for about 10-15 seconds, then remove them again.

Thank you.

Sock Drop Task

Trial 1: Now I will have you drop the sock on your baby's lap, say "oops" then after 10-15 seconds get the sock back from your baby like you normally do.

Trial 2: Thank you, let's try this one again. Drop the sock on your baby's lap, say "oops" then after 10-15 seconds get the sock back from your baby like you normally do.

Free-play

Lastly, I would like to see how you usually interact and play with your baby for few minutes (3-4minutes). Just keep playing together until I tell you to stop.

Closing

(Uncover camera) Thank you so much _____! That's all that I have for you today, thanks again for your time, we are so grateful. I will be in touch in the next few weeks to arrange our next time together. Before I go do you have any questions for me?

Thanks again, I can't wait to connect with you both again soon. Have a great rest of your day!

(End call).

Interview Script 8 Months

Introduction

(*If baby name known)* Hello _____ and _____

Thank you so much for meeting with us today, and thank you for filling out the questionnaire (or, I see that we don't have the questionnaire from you yet, if you can please complete this sometime today that would be great!). Did you have any questions about the consent form? Do you have any other questions for me/us before we get started today?

Orienting the Camera and Infant

- If the baby is not in full view of the camera say;

    - We would like to be able to see as much of your baby's body as we can, as well as, their face. Are you able to move the camera (up/down/ farther/ closer) or the baby (up/down/ farther/ closer)?
- If the Camera is on Portrait mode say;
    - Are you able to put the camera on portrait? If using a tablet/ iPad/ Phone you may have to put the device on its other side to make it landscape.

Task Introduction

Today I will ask you to do a few simple tasks with your baby. First, I will ask you to put a marker or similar sized and shaped object in your baby's hand, and have you try to get it back from them as you normally would. Second, I will ask you to put on your baby's sock and hat, leave them on for 10-15 seconds then remove them again. Third you will take their sock, drop it on their lap, say "Oops", leave it for 10-15 seconds, then get the sock back from them as you normally would. Next, I will ask you to give a small snack to your baby (like cheerios or mum mums), just give them the snack like you normally do. Lastly, I will ask you to play with your baby as you normally would for a few minutes and I will let you know when to stop.

While you are completing these tasks I will make our screen dark and will try not to make any noise so we don't distract you and your baby. We love babies, so its really hard for us to be quiet, but know we are still there and its really hard for us to be so silent because they are so cute!

I will tell you when to move on to the next task and am always there if you have any questions! Do you have any questions before we begin?

Marker Task

Okay, let's get started. First let's have you give a marker to your baby, then try to naturally get the marker back from your baby. My screen will be dark so I don't distract you or your baby, but I am still there. (Turn light off in room and observe, end task if marker is retrieved from infant or after 2 minutes pass and the infant has not yet given the marker back.)

Thank you.

Clothing Task

Now, you can put on the hat and sock, leave it on for about 10-15 seconds, then remove them again.

Thank you.

Sock Drop Task

Trial 1: Now I will have you drop the sock on your baby's lap, say "oops" then after 10-15 seconds get the sock back from your baby like you normally do.

Trial 2: Thank you, let's try this one again. Drop the sock on your baby's lap, say "oops" then after 10-15 seconds get the sock back from your baby like you normally do.

Thank you.

Snack

Now, I'll have you give your baby a small snack. Just have snack time like you normally do, and I will let you know when to stop.

Free-play

Lastly, I would like to see how you usually interact and play with your baby for few minutes (3-4minutes). Just keep playing together until I tell you to stop.

Closing

Thank you so much _____! That's all that I have for you today, thanks again for your time, we are so grateful. I will be in touch in the next few weeks to arrange our next time together. Before I go do you have any questions for me?

Thanks again, I can't wait to connect with you both again soon. Have a great rest of your day!

(End call).

Interview Script 10/12 Months

Introduction

(*If baby name known)* Hello _____ and _____

Thank you so much for meeting with us today, and thank you for filling out the questionnaire (or, I see that we don't have the questionnaire from you yet, if you can please complete this sometime today that would be great!). Did you have any questions about the consent form? Do you have any other questions for me/us before we get started today?

Orienting the Camera and Infant

- If the baby is not in full view of the camera say;
    - We would like to be able to see as much of your baby's body as we can, as well as, their face. Are you able to move the camera (up/down/ farther/ closer) or the baby (up/down/ farther/ closer)?
- If the Camera is on Portrait mode say;
    - Are you able to put the camera on portrait? If using a tablet/ iPad/ Phone you may have to put the device on its other side to make it landscape.

Task Introduction

Today I will ask you to do a few simple tasks with your baby. First, I will ask you to put a marker or similar sized and shaped object in your baby's hand, and have you try to get it back from them as you normally would. Second, I will ask you to put on your baby's sock and hat, leave them on for 10-15 seconds then remove them again. Third you will take their sock, drop it on their lap, say "Oops", leave it for 10-15 seconds, then get the sock back from them as you normally would. Then we will try something a little different. I'll get you to "Stub your toe" or "hit your knee on the table" then just react like you normally would if you had stubbed your toe or hit your knee for about 10-15 seconds. Next, I will ask you to give a small snack to your baby (like cheerios or mum mums), just give them the snack like you normally do. Lastly, I will ask you to play with your baby as you normally would for a few minutes and I will let you know when to stop.

While you are completing these tasks I will make our screen dark and will try not to make any noise so we don't distract you and your baby. We love babies, so its really hard for us to be quiet, but know we are still there and its really hard for us to be so silent because they are so cute!

I will tell you when to move on to the next task and am always there if you have any questions! Do you have any questions before we begin?

Marker Task

Okay, let's get started. First let's have you give a marker to your baby, then try to naturally get the marker back from your baby. My screen will be dark so I don't distract you or your baby, but I am still there. (Turn light off in room and observe, end task if marker is retrieved from infant or after 2 minutes pass and the infant has not yet given the marker back.)

Thank you.

Clothing Task

Now, you can put on the hat and sock, leave it on for about 10-15 seconds, then remove them again.

Thank you.

Sock Drop Task

Trial 1: Now I will have you drop the sock on your baby's lap, say "oops" then after 10-15 seconds get the sock back from your baby like you normally do.

Trial 2: Thank you, let's try this one again. Drop the sock on your baby's lap, say "oops" then after 10-15 seconds get the sock back from your baby like you normally do.

Thank you.

Empathy Task

Now I will get you to pretend to "Stub your toe" or "hit your knee on the table" and just react like you normally would if you had hurt yourself by stubbing your toe or hitting your knee on a table for about 10-15 seconds, I will let you know when to stop.

Snack

Now, I'll have you give your baby a small snack. Just have snack time like you normally do, and I will let you know when to stop.

Free-play

Lastly, I would like to see how you usually interact and play with your baby for few minutes (3-4minutes). Just keep playing together until I tell you to stop.

Closing

Thank you so much _____! That's all that I have for you today, thanks again for your time, we are so grateful. I will be in touch in the next few weeks to arrange our next time together. Before I go do you have any questions for me?

Thanks again, I can't wait to connect with you both again soon. Have a great rest of your day! (End call).

Study 2 Interview Script

10 Months

Introduction

(*If baby name known)* Hello _____ and _____

Thank you so much for meeting with us today, and thank you for filling out the questionnaire (or, I see that we don't have the questionnaire from you yet, if you can please complete this sometime today that would be great!, then obtain verbal consent if survey not completed before interview). Did you have any questions about the consent form? Do you have any other questions for me/us before we get started today?

Orienting the Camera and Infant

- If the baby is not in full view of the camera say;
    - We would like to be able to see as much of your baby's body as we can, as well as, their face. Are you able to move the camera as(up/down/ farther/ closer) or the baby (up/down/ farther/ closer)?
- If the Camera is on Portrait mode say;
    - Are you able to put the camera on landscape? If using a tablet/ iPad/ Phone you may have to put the device on its other side to make it landscape.

Task Introduction

Today I will ask you to do a few simple tasks with your baby. First, I will ask you to put a marker or similar sized and shaped object in your baby's hand, and have you try to get it back from them as you normally would. Second, I will ask you to take a spoon, drop it on their tray, say "Oops", leave it for 10-15 seconds, then get the spoon back from them as you normally would. Next, I will ask you to briefly interact with your baby with their favourite toy (about 5 seconds), then put the toy just out of reach, but still in sight of your baby. Once you put the toy out of reach, I would like you to pretend to be distracted by a book or something that is not interesting to your baby (phones or electronics are usually distracting to baby). Ignore your baby until I tell you to give them their toy back. Lastly, I will ask you to give a small snack to your baby, something that comes in pieces that can easily be shared (like cheerios). I'll have you give your baby at least 5 pieces and wait about 10 to 15 seconds, without taking any from them. Then, try to get your baby to share the snack with you as you normally would.

While you are completing these tasks I will make my screen dark and will try not to make any noise so I don't distract you and your baby. We love babies, so its really hard for us to be quiet, but know I am still there and its really hard for me to be so silent because they are so cute!

I will tell you when to move on to the next task and am always there if you have any questions! Do you have any questions before we begin?

Marker Task

Okay, let's get started. First let's have you give a marker to your baby, then try to naturally get the marker back from your baby. My screen will be dark so I don't distract you or your baby, but I am still there. (cover camera and observe, end task if marker is retrieved from infant or after 2 minutes pass and the infant has not yet given the marker back.)

Thank you.

Spoon Task

Now I will have you drop the spoon on your baby's tray, say "oops" then after 10-15 seconds get the spoon back from your baby like you normally do.

Thank you.

Favourite Toy Task

Next, briefly interact with your baby with their favourite toy for about 5 seconds, then put the toy just out of reach, but still in sight of your baby. Once you put the toy out of reach, I would like you to pretend to be distracted by your book or something else that is not interesting to your baby.. Ignore your baby until I let you know you can give them their toy back

Thank you

Snack

Now, I'll have you give a small shareable snack to your baby, making sure to give them at least 5 pieces. Wait about 10 to 15 seconds without taking any from them, then try to get your baby to share the snack with you like you normally would.

Closing

(uncover Camera) Thank you so much _____! That's all that I have for you today, thanks again for your time, we are so grateful. Before I go do you have any questions for me?

Thanks again. Have a great rest of your day!

(End call).