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THE DEVELOPMENT OF HELP-SEEKING AS A PROBLEM-SOLVING TOOL

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## ABSTRACT

When solving everyday problems, humans rely on a critical skill: help-seeking. Starting in the first years of life, children learn to use others' capabilities to accomplish their goals, such as reaching distant objects, opening difficult containers, and activating toys. How does this skill emerge across developmental time – what do help-seeking bids look like at different ages, how often do children make bids for help, and to what degree are children being strategic in their help-seeking? Additionally, what skills support help-seeking? Effective help-seeking requires a desire to solve problems, metacognitive understanding of one's own needs, communicative skill, and willingness and ability to interact with others. Might skills in areas theoretically important for help-seeking – communication, executive functioning, social cognition, mastery motivation, and temperament – relate to help-seeking at different ages? I address these questions across three studies. In Chapter 1, I review the existing help-seeking literature and pose the open questions described above. In Chapter 2, as part of a larger longitudinal study, 18-month-olds were presented with an in-lab problem-solving task and spontaneously produced bids for help. Children were sensitive to problem difficulty, producing more bids for help as the task became more challenging. Help-seeking rate positively related to vocabulary size, and problem-solving strategy related to children's executive functioning. In Chapter 3, children's propensity to seek help during easy and challenging activities was rated by parents in a novel assessment. Children asked for help significantly more during challenging activities as opposed to easy ones. Parent-reported rate of help-seeking was negatively related to Theory of Mind and prosociality – children who were more helpful and better at understanding others' perspectives were less likely to seek help overall. Strategic use of help-seeking was positively related to ToM, prosociality,

and mastery motivation – children who were better at taking others’ perspectives, who were more prosocial, and who enjoyed solving problems tended to mostly ask for help only when it was necessary. In Chapter 4, children’s spontaneous, in-home help-seeking was evaluated by coding bids for help from the same cohort of children at three ages: 14, 38, and 58 months. Help-seeking behavior changed with age, with rate peaking at three years and strategy peaking at 14 months. Rate at three years also related to vocabulary size – three-year-olds with larger vocabularies were more likely to ask for help than peers with smaller vocabularies. On average, bids received high ratings from coders judging how necessary bids were; children tended to ask for help when it was truly necessary. In Chapter 5, I review the findings from all three studies and posit questions for future research. Across three studies, I find evidence that children adapt their help-seeking to problem difficulty, and that different aspects of help-seeking – rate and strategy, among others I explore – are largely distinct from each other and relate to different skills. The emergence of help-seeking behavior is explored in detail and with a variety of methodologies.



## Chapter 1: General introduction

The hallmark of human problem-solving is not our (remarkable) ability to generate solutions on our own, nor a developmental progression from interdependence to independence. It is our flexible reliance on a dynamic balance between our own knowledge and the shared knowledge of others. Humans are intrinsically motivated to take on challenges, and also to seek and provide help – consider the numerous websites and online forums that exist solely for the purpose of addressing questions as a community (How do I change a tire? Where did this phrase come from? What should I wear to an interview?). Our ability to flexibly shift problem-solving strategies based on our own abilities and prior knowledge, as well as the situational context, is precisely what makes us so good at solving problems.

How do humans develop the ability to use flexible problem-solving? Children generate creative solutions to all kinds of problems – they create strategies, shift between them, and persevere on techniques that seem most likely to work (Collisson et al., 2016; Keen, 2011; Leonard & Schulz, 2010; McCarty et al., 1999). Children also tap a resource often ignored in the problem-solving literature – other people. We see that infants produce reaches towards a distal object when an adult is in the room more than when they are alone (Ramenzoni & Liszkowski, 2016). By preschool, children readily make bids for help from their teachers (Honig & Wittmer, 1985), and evidence suggests that individual differences in problem-solving skills, and age predict how and when they will seek help (Benenson & Koulkazarian, 2008; Goubet et al., 2006; Mosier & Rogoff, 1994a). What skills support children’s emerging help-seeking behavior?

The decision to seek help – in particular, adaptive help, which varies based on children’s independent abilities (not overreliance or dependence) – relies on a set of underlying skills. Children must first assess a problem and judge whether or not they can solve it on their own –

this assessment relies on and improves with early metacognitive skills (Goupil et al., 2016; Nelson-Le Gall, 1981). Next, they must identify (or seek out) potential help-providers and elicit their attention, a step dependent on each child’s communicative abilities and socio-cognitive skills (“Can this adult see what the problem is? Can she tell what I want?”). Lastly, children must once again evaluate the situation: did they receive the help they requested, and was that help sufficient – is the problem solved?

From this simple breakdown of the help-seeking process, it is clear that children’s early and developing cognitive and socio-cognitive skills are critical for children’s adaptive use of others when solving problems. However, little research has investigated those skills that likely underlie help-seeking. Do individual differences in early cognitive and socio-cognitive skills really relate to help-seeking behavior? In what ways? Are those impacts and individual differences stable across developmental time, as children gain experience solving an increasingly wide variety of problems? Do cognitive or communicative skills that explain help-seeking behavior in the laboratory also relate to naturally-occurring help-seeking at home? I aim to begin addressing these questions in this dissertation.

### **Prior research**

Toddlers are highly skilled at identifying others’ desires and goals, even when others’ actions – such as reaching for a toy or trying to open a container - are only partially complete or fail entirely (Brandone & Wellman, 2009; Falck-Ytter, Gredebäck, & Von Hofsten, 2006; Meltzoff, 1995; Woodward, 1998). Moreover, by 18 months, children reliably and accurately help those who need it – by picking up dropped objects, opening doors, etc. – even when such actions are costly (e.g. carrying a heavy object across the room) (Sommerville et al., 2018; Warneken & Tomasello, 2006, 2007). Toddlers themselves are skilled problem-solvers; by 10-18 months,

young children readily solve increasingly difficult instrumental problems (Bates et al., 1980; Keen, 2011). Such problems are highly similar to those used in studies investigating children's spontaneous helping behavior. From such studies, we have gained an understanding of which factors support or underlie toddlers' propensity to help, such as the costliness of helping, affinity and affiliation, culture, and social norms (Brownell, 2016; Giner Torrens & Kärtner, 2019; House, 2018; Kärtner et al., 2010; Köster et al., 2016; Newton et al., 2014; Sommerville et al., 2018). On an individual basis, helping studies have indicated that children's earlier socio-cognitive and executive functioning abilities (from 12-15 months) predict later prosocial behaviors (at 18-25 months) (Kärtner, Schuhmacher, & Collard, 2014; Stout, Karahuta, Laible, & Brandone, 2020; Traverso, Viterbori, & Usai, 2020).

Similarly, research investigating toddlers' propensity and ability to seek help from others when they encounter instrumental problems has demonstrated that help-seeking emerges along a similar (or even earlier) timeline as helping. One longitudinal project closely followed the production of gestures and vocalizations in twelve infants from the ages of 6 to 24 months (Crais et al., 2004); in this study, parents reported that infants' earliest requests for help occurred at around 6 months of age, in the form of looking paired with vocalizations directed at a distal object. By 9 months, infants produced open-handed reaching to their goals – a strategy that a separate study has found infants sensitively employ, based on the presence of available potential helpers (rather than merely being a failed action) (Ramenzoni & Liszkowski, 2016). By 11 months, infants began to use conventional points to direct adults' attention to specific problems. On average, children produced their first words or protowords in their help-seeking attempts by 13 months of age.

Beyond this regular order of emergence (gaze shifting, vocalizing, non-conventional gestures, conventional gestures, and formal language), the frequency of children's use of help-seeking – as with their frequency of helping - tends to increase over the first two years of life. One study investigating the emergence of toddlers' spontaneous bids found that, in free play sessions with mothers that occurred when infants were 12, 18, and 24 months old, infants increased their help-seeking more than any other type of type of bid (e.g. frustration, vocalizing, visual check-in), quadrupling in frequency across the second year (Bronson, 1974). Moreover, frequency of help-seeking bids is also influenced by problem difficulty from an early age. One group of investigators presented 9-, 14-, and 18-month-olds with means-end problems of escalating difficulty – an out-of-reach toy placed on a mat they could pull, then that same arrangement with the toy in a simple box, then again with a more difficult box, and so forth – such that infants had to generate and execute action plans of increasing complexity (Goubet et al., 2006). These infants' success at solving the problems, their requests for help, and their sensitivity to the demonstrations and hints provided by the experimenter were coded. All children increased their rate of help-seeking on the last three, most difficult problems. Additionally, while children across all age groups struggled with the problems, it was found that 14- and 18-month-olds were both more likely to request help and to effectively observe and replicate that help in problem-solving than were 9-month-olds.

Young children increase the variety and frequency of their help-seeking behaviors reliably and rapidly across their first two years of life, and strategically adapt these based on the objective difficulty of the problems they face. However, very little is known about what skills support the emergence of adaptive help-seeking. As reviewed above, social context and certain socio-cognitive skills (such as understanding others' intentions and engaging in joint attention) relate

to toddlers' helping behaviors. Although intuitively these factors should likewise influence children's help-seeking, the question of what social and cognitive skills influence the nature and frequency of toddlers' help-seeking bids is remains unexplored in the literature.

Cognitive skills that fall under the general domain of executive functioning – such as planning, inhibition, and working memory – play a role in children's independent problem-solving (Diamond, 2016; Zelazo et al., 1997); do these skills feed into an individual child's decision to seek help? It has been posited that sensitive, adaptive help-seeking is a unique (and underexplored) socio-cognitive skill (Nelson-Le Gall, 1981); however, little work has investigated relations between strategic use of help-seeking and related social and cognitive abilities.

In summary, we have evidence that young children begin spontaneously seeking help within the first two years of life, first through gestures and gaze and then through vocalizations and speech. At this age, children also seem to be somewhat sensitive to the context in which they are solving problems, strategically choosing to seek help more often when the task is difficult. However, our understanding of children's earliest help-seeking efforts is limited to a small group of studies, and none have investigated how individual differences between children – such as independent problem-solving skills, executive functioning, or social abilities – may influence help-seeking. Better executive functioning skills should support both independent problem-solving and the metacognitive ability to understand when success is more likely with help (Nelson-Le Gall, 1981; Roebbers, 2017). Developing social-communicative skills, such as sharing attention with social partners using gaze, gesture, and vocalizations, should underlie effective help-seeking efforts (Goubet et al., 2006; Tomasello et al., 2005).

Beyond asking questions about help-seeking in the first few years of life, we may push further to ask questions about help-seeking in preschoolers. Like younger children, preschoolers are sensitive and responsive to problem difficulty, asking for help more often when problems are challenging (Thompson et al., 2012). In regard to rate, the help-seeking literature for preschoolers is more mixed, with some studies finding that help-seeking decreases between the ages of three and five (Geppert & Küster, 1983) and others that help-seeking increases during this time (Thompson et al., 2012). However, little is known about the skills and personality traits that may relate to help-seeking in three- to five-year-olds.

What skills and aspects of temperament are important for help-seeking in preschool? While language and EF should theoretically still play a role, all typically-developing children would have the communicative and self-regulatory skills to seek help when needed by preschool. Instead, aspects of personality and other areas of cognitive development may relate to individual differences in help-seeking. For instance: help-seeking relies on children's willingness and desire both to seek help and to solve problems - thus, we may expect to see relations between an aspect of personality like shyness, as well as children's intrinsic enjoyment of taking on challenges (mastery motivation), and children's help-seeking behavior, with more shy children holding back from seeking help and, perhaps, children with more mastery motivation choosing to seek help strategically. Indeed, one study found that children with higher mastery motivation scores were more likely to seek indirect help – like hints – than have someone else solve the problem for them, when compared to children with lower mastery motivation scores (Nelson-Le Gall & Jones, 1990).

Additionally, I consider help-seeking in this dissertation to be a complex social-cognitive skill; what other complex social-cognitive skills may relate to help-seeking? In particular,

consider Theory of Mind. Prior research has demonstrated a link between temperament (shyness, among other aspects of temperament) and ToM abilities. Further, children's ability to provide help to others is contingent on their skill at assessing others' goals, knowledge, and capabilities. It may be that children's ability to flexibly take the perspective of others could relate to their ability to strategically seek out help for themselves.

### **The current studies**

In this dissertation, I will investigate these issues in three studies. In Study 1, I examine the nature of toddlers' spontaneous help-seeking bids in a lab-based problem-solving task: how sensitive children at 18 months are to problem difficulty, and what individual differences in cognitive and communicative skills relate to toddlers' propensity to seek help. I find that children at this age produced significantly more bids on difficult problems than on easy ones, and also that vocabulary size related to the number of bids (frequency) produced, while executive functioning abilities related to the timing (strategy) of those bids.

In Study 2, I follow-up with the cohort of participants from Study 1 to ask additional and longitudinal questions about help-seeking: Is it stable across developmental time? Are there relations between language, EF, and help-seeking at 5 years that are analogous to those I found at 18 months? What other aspects of sociality – particularly, temperament – relate to help-seeking? Do other higher-order social-cognitive skills, such as Theory of Mind, relate to help-seeking? In this study, which was conducted via Zoom and parent-report assessments, I find that children's Theory of Mind abilities, their prosociality, and their desire to solve problems (mastery motivation) relate to help-seeking behavior. I do not find evidence in this study that help-seeking behavior is stable across time, nor that EF relates to help-seeking behavior.

In Study 3, I investigate naturalistic help-seeking in the context of everyday problem-solving, using videos of a separate cohort of children, filmed inside their homes as families went about their daily lives, at three age points: 14, 38, and 58 months. In this study, I ask several questions: do I replicate relations between language, executive functioning, and help-seeking found in Study 1- that is, do children with larger vocabularies seek help more often overall, and do children with better EF skills strategically produce their bids for help when problems are objectively too hard for them? Do we find, in this study, any individual stability longitudinally within aspects of help-seeking behavior, or concurrent relations between different aspects? Additionally, I generate a qualitative sense of help-seeking in the home during early childhood: its frequency, its forms, and the nature of the responses children receive when they make bids for help. In this study, I find that aspects of help-seeking behavior shift with developmental time – children are most specific in their bids at 58 months, seek help the most at 38 months, and ask for help when it’s most needed at 14 months. I also find that at vocabulary size is related to frequency of help-seeking at 38 months, mirroring a relation found in Study 1. I find limited evidence of relations between aspects of help-seeking, and similarly limited evidence that children’s help-seeking and parent responsiveness are related.

Across these three studies, I investigate the emergence of help-seeking behavior across developmental time using a variety of methodologies, and stretching from the ages of 14 months to five years. In these studies, I find evidence that individual differences in children’s EF, communicative, and social-cognitive skills, as well as temperament and desire to solve problems, relate to differences in help-seeking behavior. Additionally, I describe spontaneous help-seeking – its forms and frequency – across many settings (in-lab, via parent-report, and when filmed in the home) and multiple age points. The studies in this dissertation together form an important



step in our ability to understand the ways in which help-seeking emerges throughout early childhood.

## **Chapter 2: Toddlers' use of help-seeking as a problem-solving strategy**

Toddlers are adept at solving everyday problems on their own. By the age of 18 months, young children reliably use tools to reach distal toys, plan multi-step action sequences, and correctly use conventional objects to achieve goals (e.g. using silverware to eat) (Bates, Carlson-Luden, & Bretherton, 1980; Keen, 2011). However, one critical component of young children's everyday problem-solving is underexplored: the social world. People are rarely forced to solve problems on their own, and how we use (or do not use) social partners when struggling is a critical component of human problem-solving. Indeed, seeking help is often the most effective method of solving a problem, from checking an issue with a colleague to taking a car to a shop to have brakes fixed. Likewise, young children often encounter problems that are quickly and easily solved by recruiting another's help – for example, reaching an object on a high shelf, activating a toy that has been turned off, or opening a complicated box. Children's independent problem-solving abilities thus represent only a portion of the resources children naturalistically rely on when facing challenges.

While children's use of others when problem-solving has been relatively understudied, children's response to others' help-seeking has been a subject of great interest. Toddlers are highly skilled at identifying others' desires and goals, even when others' actions – such as reaching for a toy or trying to open a container - are only partially complete or fail entirely (Brandone & Wellman, 2009; Falck-Ytter, Gredebäck, & Von Hofsten, 2006; Meltzoff, 1995; Woodward, 1998). By 18 months, children reliably and accurately help those who need it – by picking up dropped objects, opening doors, etc. – even when such actions are costly (e.g. carrying a heavy object across the room) (Sommerville et al., 2018; Warneken & Tomasello, 2006, 2007). From such studies, we have gained an understanding of which factors support or

underlie toddlers' propensity to help, such as the costliness of helping, affinity and affiliation, culture, and social norms (Brownell, 2016; Giner Torrens & Kärtner, 2019; House, 2018; Kärtner et al., 2010; Köster et al., 2016; Newton et al., 2014; Sommerville et al., 2018). On an individual basis, helping studies have indicated that children's earlier socio-cognitive and executive functioning abilities predict prosocial behaviors (Kärtner et al., 2014; Stout et al., 2020; Traverso et al., 2020).

Help-seeking behavior appears to emerge on a similar, if not earlier, timeline. As described in Chapter 1, one longitudinal project closely followed the production of gestures and vocalizations in twelve infants from the ages of six to 24 months (Crais et al., 2004). Parents reported that infants produced their first bids for help (gazes with vocalizations) at six months of age. By nine months, infants produced open-handed reaching to their goals. Open-handed reaches are a strategy that a separate study has found infants strategically employ based on the presence of available helpers (Ramenzoni & Liszkowski, 2016). By 11 months, infants started to use conventional points to direct adults' attention to specific problems. Children produced their first words in their help-seeking attempts by 13 months of age.

The frequency of children's use of help-seeking – as with their frequency of helping - tends to increase over the first two years of life. One longitudinal study, in which infants and their mothers engaged in free play sessions when infants were 12, 18, and 24 months old, found that infants' bids were help-seeking in nature more often than any other type of bid and quadrupled in frequency across the second year (Bronson, 1974). Children's frequency of help-seeking bids is also influenced by problem difficulty from an early age. One group of investigators presented 9-, 14-, and 18-month-olds with means-end problems to which infants had to plan increasingly complex solutions (Goubet et al., 2006). Coders rated or identified these

infants' success at solving the problems, their requests for help, and their sensitivity to the demonstrations and hints provided by the experimenter. Children increased their rate of help-seeking on the most difficult problems. Additionally, while children across all age groups struggled with the problems, it was found that 14- and 18-month-olds were more likely to request help. Finally, one study trained two-year-olds to ask for help when they were unsure of an answer, and found that children this age strategically produced help-seeking bids on trials where uncertainty was greatest (Goupil et al., 2016).

Children ask for help readily in the first few years of life, and strategically ask for help more often when problems are difficult. Which skills support the emergence of help-seeking behavior is less understood. Certain aspects of social and cognitive skills should, in theory, scaffold early help-seeking – for example, language abilities might enable children to seek help more frequently, and EF abilities might help children strategically time their help-seeking bids. However, the current literature does not explore these potential relations.

Executive functioning skills are critical to children's independent problem-solving (Diamond, 2016; Zelazo et al., 1997); might these skills relate to children's decisions of when and how to seek help? Better executive functioning skills should support both independent problem-solving and the metacognitive ability to understand when success is more likely with help (Nelson-Le Gall, 1981; Roebbers, 2017). Along the same lines, the development of social-communicative skills should underlie effective help-seeking efforts – children who are better communicators are better equipped to request help (Goubet et al., 2006; Tomasello et al., 2005).

Beginning early in life, young children spontaneously seek help - through gestures and gaze and then through vocalizations and speech. Young children are strategic in their use of help-seeking, choosing to bid for help more often when problems are difficult. However, we only

have theoretical predictions about how individual cognitive or social-communicative differences between children relate to help-seeking.

In the current study, I aimed to assess whether 18-month-olds demonstrate sensitivity to the difficulty of the problems they encounter - choosing to strategically and spontaneously seek help more often when problems are harder. Further, I investigated whether individual differences in relevant areas – social-communicative skills and executive functioning – would predict differences in help-seeking behavior. Tentatively, I predicted that children with better social-communicative skills would ask for help more frequently overall than their peers with worse social-communicative skills, and that those toddlers with better executive functioning skills would sensitively time their help-seeking for when problems were objectively difficult (rather than bid indiscriminately or as often on easy problems) than their peers with poorer EF skills.

To address these questions, I drew on data from a larger study, part of which involved presenting 46 18-month-old toddlers with a problem-solving task in which they had to retrieve an attractive toy with a tool across eight trials of increasing difficulty (adapted from Bates et al., 1980). During this task, toddlers could spontaneously choose to seek help from their parents or the experimenter, although no help was provided. Toddlers' help-seeking efforts – gaze alternation between adult and problem, gestures, and vocalizations – were coded. In addition, I identified other aspects of their help-seeking behavior: whether they attempted the problem before bidding for help, how long they waited to bid for help, and how often they switched between multiple communicative strategies while requesting help.

Additionally, measures were drawn from the larger study that provided information about children's EF and communicative abilities. I assessed toddlers' executive functioning abilities using a working memory task, in which a toy was hidden and participants were only allowed to

search for it after a delay, and a behavioral inhibition task, in which toddlers had to ignore an obvious but ineffective handle in order to successfully open a box (Gottwald et al., 2016). Lastly, I gauged toddlers' social-communicative skills by collecting a parent-report productive vocabulary measure (MCDI; Fenson et al., 2000).

## **Method**

### **Participants**

Participants were 46 (24 male) 18-month-olds ( $M_{\text{age}} = 17.9$  months; range 16.7 – 19.7 months) born at full term and recruited from the Chicago area, and recruited as part of a larger, longitudinal, pre-registered study ([osf.io/gv879](https://osf.io/gv879)). Participants were racially and ethnically diverse; 30.4% were White or European-American, 19.6% were Hispanic or Latino-American, 13% were African or African-American, 6.5% were Asian or Asian-American, and 30.4% were multiracial. Parents additionally reported maternal education levels: 40.4% of mothers had post-graduate education, 29.8% had bachelor's degrees, 19.1% had some college, 2.1% had an associate degree, and 2.1% had a high school degree; 6.4% declined to respond.

### **Study overview**

Caregivers completed consent forms in a waiting room, after which they and their infant were taken to a behavioral testing room. As part of a larger, preregistered longitudinal study ([osf.io/gv879](https://osf.io/gv879)), toddlers were presented with a range of tasks. Toddlers first completed the problem-solving portion then the EF measures (a helping task was administered before these tasks and several other tasks beyond the scope of this paper were administered after). Parents were given \$20 as compensation and toddlers chose a book or t-shirt to take home. Caregivers filled out the vocabulary inventory (MCDI) in-person or online within a week of their lab session.

## **Problem-solving task**

The problem-solving task (adapted from (Bates et al., 1980) involved placing various tools alongside out-of-reach toys and allowing infants to attempt to obtain the toys using these tools. The physical arrangement and type of tool provides varying difficulty to each trial within the task, with a string tied around the toy, or the toy sitting on the far edge of a cloth, being the easiest trials, and a stick or cane merely placed next to the toy (with no contact) being the most challenging. Each trial ended after the toy was retrieved, after 60 seconds had elapsed, or after the child became too distressed to continue, whichever occurred first. Throughout each trial, the experimenter reset the array or tapped the items, saying, “Can you use this to get this?” after several seconds had elapsed with no action on the toddler’s part, or whenever the toddler became distressed, was holding but ignoring the tool, or had pushed the tool off the table. Items in this task were administered in a set order by difficulty, such that the easiest items were presented first and trials increased in difficulty.

In this task, both toddlers’ accuracy and efficiency were coded to generate a “planfulness score”, as described in Bates, Carlson-Luden, and Bretherton (1980). A maximum score of 3 indicated that the participant was successful in obtaining the toy and had done so in a purposeful manner (e.g. maintained eye contact with the toy while moving it and reached for it after bringing it close enough); a score of 2 in general meant that they had displayed planful behaviors (such as moving the toy with the tool while looking at it) but had not been successful in obtaining the toy. A score of 1 implied some planful behavior, though perhaps accidental, while still failing to obtain the object (such as pulling the tool and toy off the table and not visually following either’s path); a score of 0 indicated no attempt to obtain the toy (e.g. simply looked at the array or played with the tool for its own sake). Task performance was the sum of scores

across all eight trials (range 0-24). Intercoder reliability for these scores was excellent (30% of videos double-coded; the ICC estimate was .920 with a 95% confidence interval from .892 to .942).

### **Help-seeking**

Infants spontaneously produced a number and variety of help-seeking bids throughout the problem-solving task. While children produced these bids, the experimenter would briefly acknowledge the bid (e.g. “You’re pointing.”) or would continue to prompt the child to attempt the solution, disregarding the bid. To capture help-seeking behaviors, I developed a coding scheme from prior literature investigating early help-seeking (Mosier & Rogoff, 1994b; Mundy et al., 2003). Several aspects of help-seeking were coded: first, Number of bids, being the raw number of bids infants produced; bids were identified by at least one of the Types of help-seeking behaviors occurring – infants gestured to, vocalized at, and/or switched their gaze between an adult and the problem. Second, Types of help-seeking behaviors were coded as the variety of behaviors infants produced while bidding; types of help-seeking behaviors were the following: switching gaze between adult and toy (at least two looks between an adult’s face and the problem within a 3-second window); vocalizing while producing a planful action directed at the problem (often reaching); “gimme” and pointing gestures directed at the toy; and baby sign/other gestures, an infrequent category. Third, Latency to bid, the time in seconds between the start of a trial and infants’ first bid for help (if any), was coded. Additionally, on trials in which help-seeking occurred, I identified whether the infant had made any attempt to solve the problem on their own before bidding for help; I called this measure Attempt first. I further analyzed whether children employed one or multiple communicative strategies – types of help-seeking behaviors - in each trial that included a bid for help (Likelihood of employing multiple



strategies). Reliability for these measures ranged from moderate to good; see Table 1 for full ICC estimates and CIs.

**Table 1.** ICC estimates for the help-seeking measures of interest.

<b>Help-seeking measures</b>	<b>ICC estimate</b>	<b>95% confidence interval lower bound</b>	<b>95% confidence interval upper bound</b>
<b>Types of bids</b>	.769	.726	.805
<b>Latency to bid</b>	.885	.715	.955
<b>Attempt first</b>	.725	.480	.881
<b>Multiple strategies</b>	.870	.723	.948

## **EF tasks**

### **Working memory**

In the working memory task, adapted from a prior study (Gottwald et al., 2016), toddlers were shown a box with four compartments covered with differently-colored flaps. In two warm-up trials, the experimenter demonstrated the game by hiding a toy in one of the compartments and then immediately allowing the toddler to search for it. In four test trials, toddlers watched the toy as it was hidden, then the experimenter covered the entire box with an occluder for five seconds before allowing them to search. Performance on this task was gauged by how many compartments toddlers opened on each trial before finding the toy (e.g. four points if opened on the first try, three points if opened on the second try, etc.). If more than four compartments were opened – that is, toddlers searched previously-searched locations and ignored the only unsearched compartment – they were given 0 points. Intercoder reliability for these scores was excellent; the ICC estimate was .982 with a 95% confidence interval from .955 to .993.

### **Behavioral inhibition**

In the behavioral inhibition task, adapted from the same study as the working memory task (Gottwald et al., 2016), toddlers were shown a box that could only be opened by using a

non-obvious knob at the top, while a distractor knob located on the clear Plexiglass front was non-functional. Two warm-up trials were administered, in which the experimenter put the box, empty, on the table in front of participants and announced, “Look! This is my box, and it opens like this,” then opened the box using only the effective knob. After this, the experimenter pushed the box forward so that participants could reach it and asked, “Can you open my box?”. After toddlers had successfully opened the box twice, the experimenter said, “Good! Now, do you think anything can go in this box?” After this, four trials were presented in which different highly-appealing toys were placed inside the box. Toddlers had to inhibit obvious but ineffective methods of obtaining the toy (pulling the front knob or hitting the clear window) and instead reach for the less obvious and more distant top knob to receive full points (a score of two). Toddlers who immediately reached for the correct knob were given two points; those who reached for the front of the box at first but then corrected themselves were given one point, and those who never adjusted and could not open the box were given no points. Intercoder reliability for these scores was excellent; the ICC estimate was .959 with a 95% confidence interval from .897 to .985.

## **Results**

In this study, I aimed to examine the nature of young children’s help-seeking: is it responsive to problem difficulty? What individual differences in cognitive or communicative skills might relate to help-seeking? In order to address these questions, I first analyzed performance on the problem-solving task, then investigated the help-seeking behaviors that occurred during it – their frequency, when they occurred, their forms, and how these factors varied by problem difficulty. Finally, I explored potential relations between help-seeking and cognitive and communicative skills by running a series of linear mixed-effect regressions

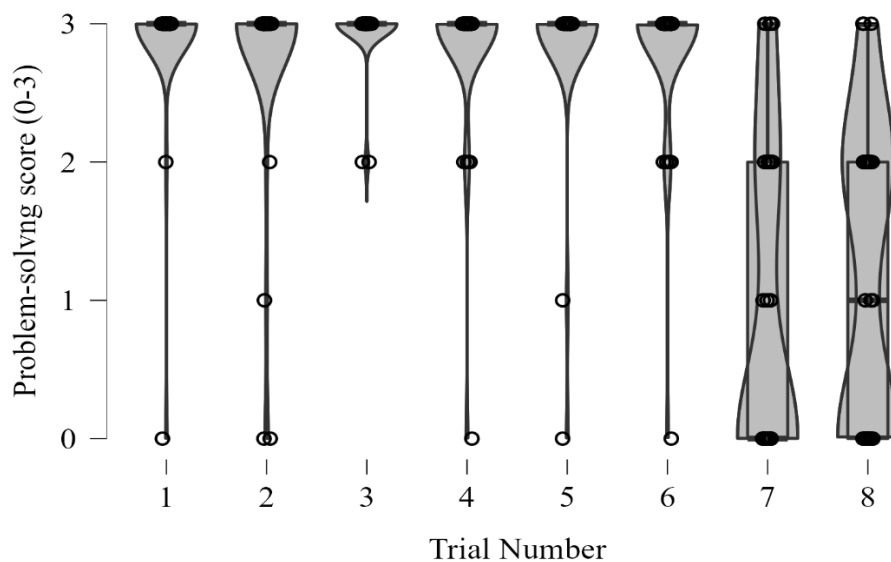
predicting aspects of help-seeking by problem difficulty and children's cognitive and communicative skills.

## Problem-solving task

### Performance on the problem-solving task

In the problem-solving task, subjects received an average performance score of 18.9 (SD = 2.9, range 11-24). Rather than trials increasing gradually in difficulty as expected, I found that the first six items, in which the toy maintained some physical connection with the tool, were significantly easier for 18-month-olds to solve than the last two items, in which tool and toy are completely separated physically (see Figure 1). Therefore, problem-solving performance scores were collapsed by trial difficulty: the first six easy trials (M = 2.82, SD = .50) and the last two hard trials (M = 1.01, SD = 1.00). Performance on the problem-solving task was not significantly related to age or executive functioning scores (both  $p$ s > .11).

**Figure 1.** Toddlers' average performance on the problem-solving task by trial, with 3 being the maximum score. Note the steep drop-off in performance on Trials 7 and 8.



## Help-seeking

Across all trials, 36 (87.8%) of the 41 subjects produced at least one help-seeking behavior, with only five subjects never exhibiting help-seeking. Help-seeking bids were examined by the communicative strategies that occurred during them: on average, across all trials, 39.5% of behaviors included vocalizations, 26.2% included gaze switches between the experimenter and the problem, 24.7% included finger points to the toy, 6.9% included other gestures, and 2.7% included gaze switches between a parent and the problem.

In the next analyses, I examined whether children's help-seeking behavior varied as a function of problem difficulty. Number of help-seeking bids per trial type did indeed vary by trial difficulty, with the average number of bids increasing across difficulty levels ( $M_{\text{easy}} = 0.27$ ,  $SD_{\text{easy}} = 0.50$ ;  $M_{\text{hard}} = 2.04$ ,  $SD_{\text{hard}} = 1.73$ ). See Table 2 for full descriptive statistics split by trial difficulty. Overall, on difficult trials, toddlers were significantly more likely to try first and help-seek more. Toddlers took marginally longer to ask for help and were marginally more likely to use multiple strategies (bid types) on difficult trials.

**Table 2.** Descriptive statistics, split by trial difficulty, of toddlers’ total help-seeking, averaged across trials; toddlers’ proportion of trials in which they attempted the problem before asking for help; the time between presentation of the trial to toddlers’ first bid for help; and percent of trials in which toddlers used multiple strategies while help-seeking. Asterisks indicate significant differences in behavior between easy and difficult trials.

	Total help-seeking		Attempt first		Time to first bid		Likelihood of employing multiple strategies	
	<b>Difficult</b>	<b>Easy</b>	<b>Difficult</b>	<b>Easy</b>	<b>Difficult</b>	<b>Easy</b>	<b>Difficult</b>	<b>Easy</b>
Mean	2.04	0.27	0.81	0.55	11.40	9.36	0.64	0.42
Std. Deviation	1.73	0.50	0.35	0.47	9.28	8.23	0.41	0.45
T-test: comparing variables across easy and difficult trials	$t(80) = 6.26^*$ p < .001		$t(52) = 2.33^*$ p = .023		$t(52) = 0.80$ p = .065		$t(52) = 1.83$ p = .073	

Additionally, I examined whether aspects of help-seeking behavior varied by the performance scores toddlers received on each trial. Number of total help-seeking bids and likelihood of employing multiple strategies during help-seeking were both significantly related to the performance scores children received, such that toddlers asked for more help and were more likely to use multiple bid types on trials where toddlers ultimately received low scores (see Table 3).

**Table 3.** Correlations between aspects of help-seeking behavior and scores, by trial, on the problem-solving task.

	Total help-seeking	Attempt first	Time to first bid	Use of multiple strategies
Performance score on problem-solving task	F(1, 14.76) = 40.49, p < .001	F(1, 21.41) = 2.33, p = .14	F(1, 16.22) = 1.26, p = .28	F(1, 14.77) = 7.85, p = .014

## **Help-seeking: relations to EF and social-communicative skills**

In the previous analyses, I established that toddlers do indeed seek help, and that help-seeking varies on a group level by problem difficulty. My next question was whether help-seeking was statistically predicted on an individual level by children's EF and social-communicative skills, and whether problem difficulty interacted with these factors.

For the EF measures, performance was variable on both the working memory ( $M = 9.4$ ,  $SD = 3.0$ , range = 1-16) and behavioral inhibition ( $M = 6.1$ ,  $SD = 1.6$ , range = 2-8) tasks. These two tasks were marginally correlated;  $r(34) = .311$ ,  $p = .057$ ). For simplicity, an EF summary score was created by z-scoring subjects' performance on both tasks and averaging those z-scores together. On the MCDI, caregivers reported that their children were producing an average of 14.7 words ( $SD = 13.1$ ).

To assess whether executive functioning and vocabulary predicted aspects of help-seeking, and varied by problem difficulty, I ran a series of linear mixed-effects regressions (Bates, Mächler, Bolker, & Walker, 2015). With my four measures of help-seeking as dependent variables – total number of help-seeking bids, attempting before first bid, time to first bid, and type-to-token ratio between variety of bids over total number of bids – I ran four linear mixed-effects regressions with MCDI, EF, and problem difficulty as fixed-effects factors and subjects as a random-effects factor. I first ran these models with all interaction terms; when no interactions emerged, I reran the models with no interaction terms. Results from these regressions are presented in Table 4.

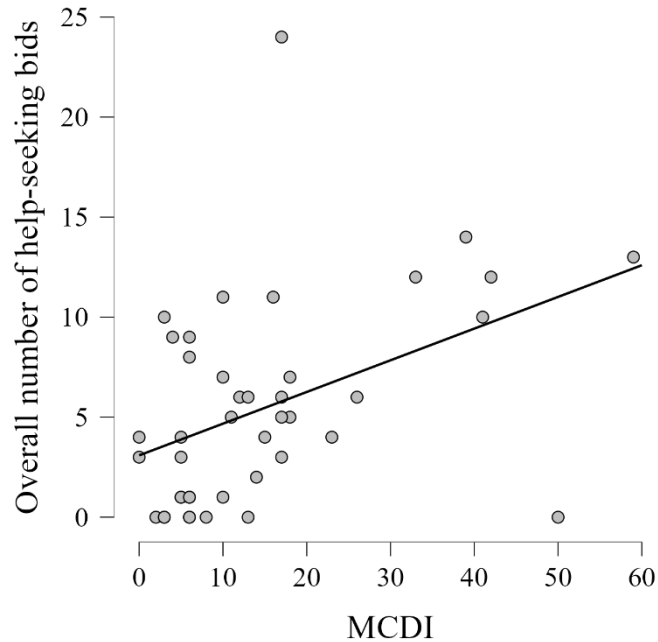
**Table 4.** Results from mixed-effects linear regressions; F-statistic (p-value). Asterisks indicate significant p-values, † indicate marginally-significant p-values.

	Vocabulary	EF	Problem difficulty
Total help-seeking	5.31 (.027)*	0.05 (.83)	35.84 (<.001)*
Attempt before bid	3.45 (.070)†	0.61 (.44)	4.46 (.040)*
Latency to bid	0.13 (.72)	4.56 (.042)*	0.82 (.37)
Use of multiple strategies	0.79 (.38)	0.18 (.68)	4.20 (.051) †

### Overall rate of help-seeking

The first regression revealed a main effect of vocabulary ( $F(1, 34) = 5.31, p = .027$ ; see Figure 2) and a main effect of problem difficulty, such that toddlers requested help more often during difficult problems than during easy problems ( $F(1, 36) = 41.79, p < .001$ ). A follow-up correlation revealed that children with larger vocabularies produced bids for help more often than did children with smaller vocabularies,  $r(38) = .37, p = .022$ . Individual differences in language ability predicted the number of help-seeking bids toddlers produced, such that children with larger vocabularies produced more help-seeking bids, and increases in problem difficulty were related to an increase in the number of total bids.

**Figure 2.** Scatterplot depicting the relation between total help-seeking across trials (x-axis) and MCDI score (y-axis).



### **Attempt before bid**

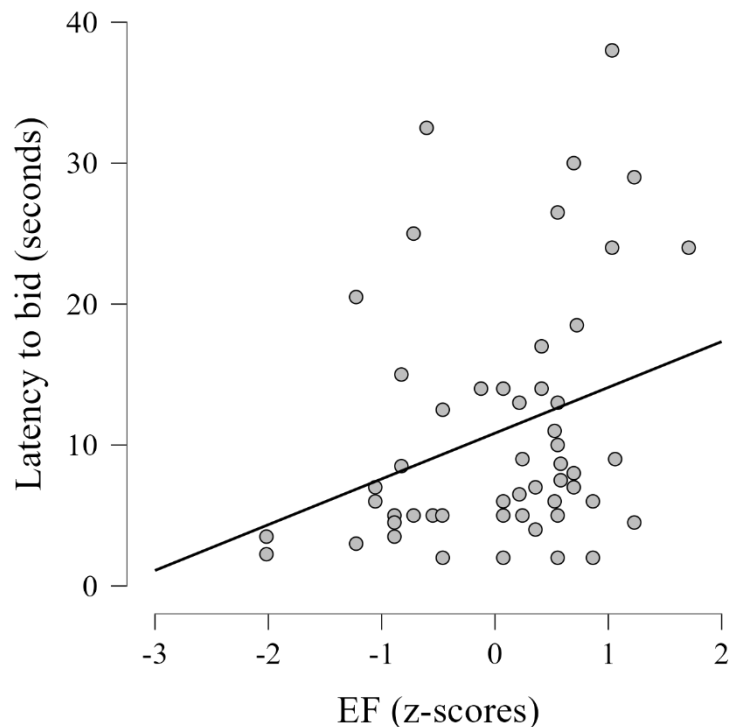
Toddlers' propensity to attempt to solve the problem on their own before bidding for help marginally related to vocabulary size ( $F(1, 45) = 3.45, p = .070$ ); a follow-up correlation revealed that children with larger vocabularies were less likely to attempt the problem before bidding for help than were their peers with smaller vocabularies ( $r(34) = -.37, p = .03$ ). A main effect of problem difficulty also emerged,  $F(1, 45) = 4.46, p = .040$ , such that toddlers were more likely to attempt the problem before asking for help on difficult rather than easy problems. EF did not significantly relate to toddlers' propensity to attempt before bidding ( $F(1, 45) = 0.61, p = .44$ ). Increases in vocabulary size negatively related to toddlers' propensity to try first before requesting help, and toddlers were more likely to ask for help without attempting the problem first on easy problems.



### Latency to bid

EF significantly related to toddlers' latency to bid for help ( $F(1, 26.23) = 4.56, p = .042$ ; see Figure 3); a follow-up correlation revealed that toddlers with better EF skills waited longer to ask for help after trial onset ( $r(35) = .37, p = .029$ ). Problem difficulty and vocabulary did not significantly relate to children's latency to bid for help (both  $ps > .37$ ). While problem difficulty did not relate to how long toddlers waited before bidding for help, individual differences in executive functioning abilities positively related to how long toddlers observed or attempted the problem before producing a bid for help.

**Figure 3.** Scatterplot depicting the relation between EF (x-axis) and toddlers' latency, in seconds, to bid for help (y-axis).



### Multiple types of strategy

Individual differences in vocabulary and EF did not relate to toddlers' propensity to use multiple types of strategies when requesting help, both  $ps > .38$ . However, this aspect of help-

seeking was marginally related to problem difficulty,  $F(1, 25.24) = 4.20, p = .051$ , such that children were more likely to employ multiple strategies in their bids during difficult, as compared to easy, problems.

### **Discussion**

In this study, I found that 18-month-olds ask for help when faced with challenging problems. Toddlers at this age were sensitive to task difficulty, asking for help more often and using more communicative strategies when problems were especially challenging. Further, rate of help-seeking was predicted by toddlers' vocabulary size – such that children with larger vocabularies produced more bids for help – while the timing of those bids was related to executive functioning abilities, such that children with better EF skills waited longer after being presented with a problem to bid for help. From these findings, we may begin to make inferences about what social and cognitive skills underlie early help-seeking behavior.

Toddlers' help-seeking behavior varied both by problem difficulty and by the scores that children ultimately received on each trial. On difficult trials, toddlers were more likely to bid for help, take longer before requesting help, and use multiple strategies than on easy trials. Performance on the problem-solving task also related to help-seeking behavior; on trials where toddlers ultimately received a low score, they were more likely to ask for help, attempt the problem before requesting help, and use multiple strategies than on trials where they ultimately received a high performance score. Toddlers varied the timing, frequency, and variety of their help-seeking behaviors with problem difficulty, demonstrating that toddlers can strategically adapt and deploy multiple aspects of help-seeking in response to changes in problem-solving context.

I further examined whether help-seeking was related to individual differences in social-communicative skills and executive functioning abilities. Vocabulary size related to the frequency of help-seeking bids as well as toddlers' propensity to try problems before bidding for help, such that increases in vocabulary size positively predicted total number of help-seeking bids and negatively related to how likely children were to attempt the problem before bidding. In this study, children with larger vocabularies produced more bids for help and were less likely to try problems on their own before producing those bids.

Individual differences in executive functioning also related to help-seeking behavior; children with better EF waited longer than their peers with worse EF before producing a bid for help. As predicted, differences between children in their social-communicative skills (vocabulary size) and executive functioning skills (behavioral inhibition and working memory) related differentially to distinct aspects of help-seeking – frequency and strategy. Although I did not find that children with better EF skills waited until more difficult trials to bid for help, I did find that those children observed or attempted problems for longer, on average, than their peers with worse EF skills.

Overall, it seems that children's adeptness at and willingness to communicate effectively with others – as indexed by their vocabulary size – relates to how often children will make bids for help, irrespective of problem difficulty; that is, children with better communicative skills may have a higher propensity to ask for help when solving problems as this problem-solving tool is easy and accessible for them, whereas children with worse communicative skills may be less willing or able to seek help, and may avoid doing so until problems are sufficiently difficult. In contrast, I found that the timing of help-seeking was related to executive functioning and not vocabulary; this allows me to predict that children's metacognitive sense of their own abilities,

as well as the objective difficulty of problems, relates to early strategic use of help-seeking while problem-solving. While toddlers' likelihood of trying to solve the problem was not significantly related to individual differences in EF abilities, children with better EF skills had longer latencies between the problem being presented and producing their first bid for help, when compared to children with worse EF skills. Children with better EF skills may imagine or mentally simulate potential solutions for longer than children with worse EF skills. Alternatively, or in addition, children with worse EF skills may lack the inhibitory abilities to examine problems for lengthy amounts of time or to refrain from requesting help right away. To my knowledge, this is the first study that has identified individual differences in very young children that relates to their help-seeking behavior, and thus represents our first steps into understanding help-seeking as a complex problem-solving tool supported by early social and cognitive abilities, much like other higher-order social-cognitive skills (such as Theory of Mind).

Toddlers in this study varied their help-seeking behavior by trial difficulty as well as by differences in their communicative and cognitive skills, indicating that, by 18 months, help-seeking is a nuanced socio-cognitive behavior predicted by distinct aspects of young children's early social and problem-solving abilities. Indeed, this paper provides evidence that help-seeking is a difficulty-sensitive problem-solving tool, one with multiple aspects (number of bids, timing, etc.) that vary differentially in relation to linguistic and cognitive abilities.

Toddlers' help-seeking attempts were primarily gestures or non-verbal vocalizations – so the relation between help-seeking and vocabulary size is intriguing. I posit that vocabulary size here is indexing something closer to ability and willingness to communicate with social partners – toddlers more adept and motivated to communicate generally also more readily bid for help in challenging contexts. Indeed, for children motivated by social connection, seeking help may be

more rewarding than independent problem-solving – and vocabulary size might index social motivation or sociality at this age. As predicted, children with larger vocabularies made more bids for help than their peers with smaller vocabularies, regardless of problem difficulty. I expected that individual differences EF might emerge during the difficult trials, such that children with better EF skills would be more likely to produce bids for help as problems became harder (whereas children with worse EF might ask for help earlier or regardless of problem difficulty). However, the difficult trials were uniformly highly challenging and the easy trials generally very easy to solve – perhaps the pattern I expected might have emerged if problems objectively became more difficult gradually. Help-seeking in the easy trials of this study may have more often been a result of children “checking in” socially, rather than actually struggling with the problem. Another potential limitation of this study is that help-seeking bids were not responded to (help was not given whether it was requested or not) – a situation that is, presumably, unusual in toddlers’ everyday lives. Perhaps spontaneous help-seeking behavior follows different patterns when bids are naturally responded to by a social partner. However, one benefit of not responding to help-seeking bids in this study is that this behavior was not reinforced or guided in any way.

### **Future questions**

In this study, I find that an index of communicative skill – vocabulary size – significantly related to how many bids for help children produced, as well as how likely they are to attempt problems before bidding for help. I found that executive functioning abilities related to a different aspect of help-seeking – the timing of bids for help after being presented with a problem. From these findings, we may generate a set of questions about the emergence of help-seeking: how exactly do early communicative and cognitive skills support help-seeking and,

consequently, problem-solving? Toddlers with larger vocabularies produced more bids for help than toddlers with smaller vocabularies, regardless of problem difficulty; how does the relation between communication and problem-solving, linked by help-seeking, emerge over developmental time? Some of children's earliest communicative bids – pointing and non-verbal vocalizing – may be produced with the intention of eliciting help. How does this relation evolve as children's communicative skills shift and grow? Children with better vocabulary skills were also more likely to produce a bid for help before attempting the problem (or, alternatively, children with worse vocabularies were more likely to try solving problems on their own before turning to a social partner). How do early social skills impact young children's choices about tackling problems on their own? Are children who are skilled and willing communicators more at risk for becoming over-dependent on help, failing to utilize opportunities to solve problems independently – or more likely to generate learning opportunities for themselves by eliciting help from others? Children with better EF skills waited longer than their lower-EF peers to request help, but not necessarily to begin acting on the problem – what cognitive processes are occurring when high-EF children observe or attempt problems before they choose to ask for help? Might a lack of inhibitory skills prevent children with low EF from studying or working on problems before seeking help? Do better cognitive skills generally relate to children's ability to time their requests for help, holding off until problems have been mentally or manually attempted? In general, this study leaves open questions about individual variations children's social-communicative skills, cognitive abilities, and help-seeking behaviors that call for a larger sample size to better investigate.

More broadly – help-seeking in this study occurred in a laboratory setting, and the experimenter did not respond to children's bids for help. This is how individual problem-solving

skills are typically studied – are children spontaneously producing bids for help during other studies investigating young children’s planning abilities? If so, should any in those studies help-seeking be re-examined as a useful problem-solving strategy? The trials in the current study were administered in order of difficulty, as is typical of other problem-solving tasks; what help-seeking behaviors might emerge if, for example, a hard trial was administered first, before children had experienced success in the task? It may be that children would, instead of seeking help, show frustration with the task and attempt to disengage. In the current context, in which children’s performance was somewhat scaffolded (success was certain for the earliest trials, and solving these trials gave children the solution for several trials following), help-seeking may have been particularly supported.

Beyond the laboratory, how do young children learn to adaptively seek help to solve problems in naturalistic settings, and with social partners who are willing to assist? How often do very young children spontaneously find themselves in problem-solving situations, and when and how do they employ help-seeking to solve their own problems?

In this study, I found that a majority of 18-month-olds spontaneously request help when problem-solving. Moreover, I found that various aspects of help-seeking behavior – timing, frequency, and variability – relate both to problem difficulty as well as individual differences in social-communicative and cognitive skills. This study provides evidence that help-seeking is a robust behavior spontaneously employed by young children when solving problems, and that this behavior is multi-faceted, with different aspects relating to different areas of social and cognitive development. I argue that help-seeking is a complex, adaptive social-cognitive skill, one whose study is critical to our understanding of young children’s problem-solving strategies and abilities.

### **Chapter 3: Relations between help-seeking, executive functioning, temperament, and social-cognitive skills in preschoolers**

Help-seeking is a ubiquitous problem-solving tool that humans use from the first years. Beginning early in life, children spontaneously choose to ask for help from others, and this behavior occurs most frequently when children are solving problems (De Cooke & Brownell, 1995). As children enter preschool and kindergarten, they turn their bids for help towards teachers (Puustinen, 1998). A majority of the research on children's help-seeking focuses on this context: academic help-seeking that occurs between students and teachers (Calarco, 2011; Kyza, Georgiou, Hadjichambi, & Hadjichambis, 2013; Newman, 1990; Newman & Schwager, 1993; Ryan, Gheen, & Midgley, 1998) or in regard to academic achievement generally (Newman & Schwager, 1998; Puustinen, 1998).

These studies, and a handful of studies investigating help-seeking in younger children, have found that early help-seeking occurs often and varies by problem difficulty, and that children adaptively seek out help that assists them in solving problems (rather than seeking out end solutions) (Goubet, Rochat, Maire-Leblond, & Poss, 2006; Goupil, Romand-Monnier, & Kouider, 2016; Nelson-Le Gall, 1981, 1987; Newman, 2000). Thus, we have evidence that young children frequently, spontaneously, and sensitively bid for help when solving problems (such help-seekers are variably called instrumental, strategic, adaptive, or self-regulating; Puustinen, Kokkonen, Tolvanen, & Pulkkinen, 2004).

However, some basic questions remain uninvestigated: what skills or proclivities relate to children's help-seeking? Help-seeking is, by definition, the consequence of both cognitive and social efforts, as well as internal motivation to solve problems (Nelson-Le Gall, 1981; Newman, 2000). There has been little investigation of the skills that may support help-seeking in early



development, including general cognitive abilities (executive functioning), the propensity to be socially engaged (sociality), and social-cognitive and communicative skills like Theory of Mind and vocabulary. Might individual differences in children's problem-solving and social-cognitive skills, as well as their sociality, relate to their willingness to help-seek, and how strategic or adaptive that help-seeking is? That is, if help-seeking is a strategic and social behavior, then understanding how it emerges in development will involve investigating aspects of sociality, such as temperament, as well as following the trajectory of the development of EF and social-cognitive abilities. Next, I consider each of these in turn.

### **Executive functioning and help-seeking**

Normative developmental changes in EF skill may relate to children's ability to use help-seeking when solving problems. Executive functioning abilities have been found to relate to another social-cognitive skill, Theory of Mind (Carlson et al., 2004; Carlson & Moses, 2001; Farrar & Maag, 2002; Milligan et al., 2007). Just as EF abilities such as inhibitory control and working memory support complex social-cognitive skills like Theory of Mind, so also might they support young children's help-seeking – by inhibiting ineffective solutions, recalling previous attempts, etc. One study, conducted with 8- to 12-year-olds, found that children's self-regulated (e.g. adaptive) help-seeking behavior was related to longer thinking times before children asked for help, indicating a potential relation between inhibitory skills and adaptive help-seeking (Puustinen et al., 2004, 2008). Similarly, in a Study 1, I found that executive functioning skills related to the timing of 18-month-old children's bids for help, such that children with better EF abilities waited longer than their lower-EF peers to ask for help, spending more time surveying or attempting the problem. Executive functions also support metacognition (Fernandez-Duque et al., 2000; Shimamura, 2000), a key step in the help-seeking process.

Beyond this, our understanding of how executive functioning skills and help-seeking behaviors interact is limited. How might young children's developing ability to inhibit responses, or recall previous solutions, relate to when and how they choose to seek out help?

### **Social-cognitive and communicative skills and help-seeking**

As indicated above, help-seeking is dependent on social interactions (Nelson-Le Gall, 1981; Newman, 2000), and exemplifies the importance of social factors on learning and cognitive development (Newman, 1990a). Some work has been done on how help-seeking is perceived by peers (Nelson-Le Gall & Glor-Scheib, 1986) and by children themselves (Newman & Schwager, 1993). However, little work has investigated whether variations in children's own social-cognitive and communicative skills relate to their willingness to employ help-seeking as a strategy while solving problems. For example, individual differences in communicative abilities, such as vocabulary, may relate to children's willingness or ability to seek help at all. Indeed, I found this relation in a prior study; for 18-month-olds in Study 1, vocabulary size predicted toddlers' frequency of help-seeking – even when most help-seeking bids were non-verbal, vocabulary still positively correlated with how often children sought help. Vocabulary, like EF, has been found to relate to Theory of Mind abilities (Carlson & Moses, 2001; Carlson et al., 2004; Farrar & Maag, 2002; Milligan et al., 2007). Language helps young children track others' beliefs and desires, and may also help them recruit effective help from others. In early childhood, children who are further along in their communicative development may likewise be further along in their use of help-seeking while solving problems.

Further, help-seeking is a complex social-cognitive skill that relies on the help-seeker's ability to understand the limits of their own skills, perspective-take, communicate effectively, and adequately react to the help-seeking response (Nelson-Le Gall, 1981). Other social-cognitive

skills – such as Theory of Mind – likewise rely heavily on individuals’ social and executive functioning skills. I may predict that those children who are more adept at assessing problems from another’s point of view will also more effectively elicit support from others while solving problems themselves.

### **Mastery motivation and help-seeking**

Children’s willingness to seek help is dependent on their internal motivation to solve problems; this concept is referred to as mastery motivation (De Cooke & Brownell, 1995; Morgan et al., 2020; Newman, 1990b). One study found that children with higher scores on a mastery motivation scale were more likely to seek indirect help, like hints, than were children with lower mastery motivation scores, who showed no preference between indirect help and direct help (e.g. answers to the task) (Nelson-Le Gall & Jones, 1990). Do children in this study, similarly, vary their help-seeking efforts by their intrinsic pleasure in tackling challenges? While I do not differentiate between bids for direct and indirect help, might I see that children with higher mastery motivation scores produce more bids for help, or strategically ask for help more often on challenging vs. easy tasks?

### **Sociality and help-seeking**

Alternatively, or in addition, it may be that aspects of children’s temperament, which are stable across developmental time, impact children’s help-seeking, e.g. children who are more outgoing and sociable may be more likely to seek out help and learn how best to use this problem-solving tool over time, while shy children miss out on these experiences. Temperament has been found to relate to children’s social-cognitive skills; studies have shown relations between aspects of toddlers’ and preschoolers’ temperament – their shyness, activity level, lack of aggressiveness, social-perceptual sensitivity, and inhibitory control – and their Theory of

Mind abilities (LaBounty et al., 2017; Wellman et al., 2011). These authors argue that temperament predicts the kinds of social interactions young children have, and those interactions, in turn, influence and alter the course of children's social-cognitive development. Children who are more temperamentally inclined to orient to and affiliate with others may, I posit, be more willing than their less-social peers to turn to others for help when solving problems.

## **The current study**

### *Concurrent relations*

In a prior study, I found evidence that toddlers robustly and sensitively ask for help, and that their help-seeking is related to individual differences in cognitive and social-communicative abilities. Specifically, vocabulary size related to how often 18-month-olds produced bids for help, whereas executive functioning abilities related to the timing of those bids. Children with larger vocabularies made more bids overall than their peers with smaller vocabularies; children with better EF skills waited longer before bidding for help. Based on the findings from my prior study, and the theoretical connections between factors outlined above, I aimed to assess relations between children's rate and strategic use of help-seeking and their temperament and mastery motivation, as well as their developing social-cognitive, communicative, and EF skills.

In the current study, I developed a parent-report measure of children's everyday help-seeking behavior. In order to measure how often and how strategically children were employing help-seeking, I asked parents to rate how likely their children were to ask for help on problems that were easy and difficult for them. From the measure, I was able to assess how often children were bidding for help (across easy and difficult types of problems) and how strategic they were in deploying help-seeking, by the difference between the average amount of help-seeking children used on difficult vs. easy problems.

### *Longitudinal relations*

From existing work, we have some understanding of how executive functions, social cognition and sociality, and mastery motivation may relate to young children's help-seeking. However, to my knowledge, no work has investigated the development of help-seeking within individuals. Does children's propensity to seek help remain relatively stable across developmental time? How does a child's early help-seeking behavior – their frequency of asking for help and how sensitively they adapt that behavior in response to problem difficulty – relate to these variables at a later age? That is, might children's overall use of help-seeking relate to aspects of their social skills, and their strategic use of help-seeking relate to their cognitive abilities? What early social and cognitive skills relate to later help-seeking behavior?

The current study was conducted with the same sample as in the prior study, giving me the opportunity to ask questions about this cohort of children at an older age. My interests in this longitudinal aspect of the study were twofold; firstly, I asked whether help-seeking is more or less trait-like – that is, might help-seeking, like aspects of temperament, be stable across time? For example, a toddler who asks for help a great deal may continue to do in preschool; on the other hand, a toddler who avoids making bids for help may struggle to develop the skills needed or reap the benefits of asking for help. The question of the relative stability of help-seeking is, to my knowledge, completely unaddressed in the existing literature. Therefore, I aimed to assess how frequently and how sensitively children in this cohort were asking for help in everyday contexts at age five. I aim to compare these two measures with analogous measures from when these children were toddlers – frequency and strategic use of help-seeking – to investigate whether individual differences in help-seeking “styles” are relatively stable across developmental time.

Secondly, I asked questions about how vocabulary and executive functioning relate to help-seeking across developmental time. It may be that the children's earliest experiences with help-seeking, structured by individual propensities and capabilities to solve problems with others, is more predictive of later help-seeking than measures of vocabulary and EF collected concurrently with later help-seeking behavior. If help-seeking at 18 months is supported or scaffolded by toddlers' concurrent vocabulary and EF abilities, those early experiences with help-seeking – on a spectrum from effective utilization of social supports to underuse or overdependence on others to solve problems – may be the strongest predictors of children's continued frequency and sensitivity of help-seeking. To probe this question, I related help-seeking across timepoints while controlling for effects of executive functioning skills and vocabulary, in order to detect whether these factors play a role in the relation between help-seeking in toddlerhood and later help-seeking.

## **Method**

### **Participants**

Participants were 65 5-year-old children ( $m_{age} = 58.6$  months, range = 53.8-73.6 months) recruited primarily from the Chicagoland area. Participants were racially and ethnically diverse; 56.9% were White or European-American, 9.2% were Hispanic or Latino-American, 7.7% were African or African-American, 7.7% were Asian or Asian-American, and 16.9% were multiracial. Parents additionally reported maternal education levels: 50.8% of mothers had post-graduate education, 30.8% had bachelor's degrees, 9.2% had some college, 7.7% had an associate degree; 1.5% declined to respond. See Table 5 for full demographic information.

**Table 5.** Demographic information for participants in the current study, split by whether families participated in both study timepoints or only the later timepoint.

	Mean age	Gender	Race/Ethnicity	Maternal education
Longitudinal participants (n = 32)	56.4 months (SD = 3.58)	15 female, 18 male	European = 14 African-American or Black = 5 Asian = 1 Hispanic = 4 Multiracial = 7 Other or did not complete = 1	Some high school = 0 Some College = 6 Associate = 1 Bachelor's = 10 Post-Graduate = 14 Did not complete = 1

### Study overview

Parents were recruited to participate over email. Families who had previously participated in the longitudinal arm of the study were reminded of their past participation and asked to come in again; non-longitudinal participants were invited to join a study about children’s developing social cognition. For details on the previous study, see Chapter 2. After expressing interest in participating, all parents were sent a link to the consent forms and parent questionnaires (hosted on Qualtrics) and asked to complete these prior to the Zoom portion of the study; parents were also sent a link to schedule a time for the Zoom appointment. At the time of the Zoom appointment, the experimenter explained what activities the child was about to engage in, how long the experiment would take, and parents were asked to confirm that they were comfortable with the Zoom session being recorded. Parents were told they could stay and watch the session if they refrained from prompting or giving hints; some parents stayed with their child for the duration of the study while others left the room. Then, the behavioral tasks were administered (details below), after which parents were again asked if they were comfortable with the recording being kept.

### Behavioral tasks

Four tasks were administered during the Zoom session. First was a battery of Theory of Mind items (from Wellman & Liu, 2004); children were given vignettes in which they had to take the perspective of another person to answer questions correctly, while a shared screen displayed a Powerpoint with pictures that related to the stories. This task was drawn directly from the original Wellman and Liu task. The experimenter read the vignettes aloud to the participants while relevant images were displayed. For example, as the experimenter read, “Linda is looking for her cat. Her cat might be hiding in the bushes or in the garage”, the Powerpoint slides displayed an image of a clipart child standing next to a clipart garage and bush.

Next, children participated in a Stroop-like task to assess their behavioral inhibition (Gerstadt et al., 1994) where they were trained to respond “Day” to a picture of the night sky and “Night” to a picture of the sun; participants were then given 16 test trials. Training was two trials of practice with the day/night images; two extra trials of training were given if children failed the first two. In this online adaptation of the Day/Night Stroop task, the day/night images were displayed for one second, and two seconds of a blank screen separated trials.

After this, the Zoom screen-share ended, so that the participant and experimenter faced each other with no other materials. Children were given a forward digit span task to assess their working memory (Chen & Stevenson, 1988), in which they were told a series of numbers of increasing length and asked to repeat them back; this task continued until children made errors on two digit string lengths in a row. Children were first introduced to a stuffed animal that repeated the experimenter as she recited a two-digit string; children were asked if they could be like the stuffed animal and copy the experimenter. Two training trials were administered in which children repeated two two-digit number strings; after completing training, the test trials



began with a two-digit number string and then two three-digit number strings, two four-digit number strings, and so on until children incompletely repeated two number strings in a row.

Finally, children were asked to stand for a second behavioral inhibition task, Head-Shoulders-Knees-Toes (Cameron Ponitz et al., 2008; McClelland et al., 2014), in which children were told to do the opposite of what the experimenter said (i.e. touch toes when experimenter says to touch head; touch knees when experimenter says to touch shoulders). First, children were taught to touch their toes when the experimenter told them to touch their head (and vice versa); four training trials were administered in which children were praised for correctly performing the opposite action or corrected if they did not. Then, ten test trials were administered. If participants responded correctly to a majority of the first ten trials, they were taught a new rule: to touch their knees when the experimenter told them to touch their shoulders (and vice versa). They were again given four training trials, and then ten test trials were administered in which both rules were used (children had to remember how to respond when told to touch their head, shoulders, knees, and toes).

### **Parent questionnaires**

Prior to the Zoom session where the behavioral tasks were administered, parents completed five surveys online: the Child Behavior Questionnaire (Rothbart, 1981), the Children's Social Understanding Scale (Tahiroglu et al., 2014), the Ratings of Everyday Executive Functioning Scale (Nilsen, Huyder, McAuley, & Liebermann, 2017), the Developmental Vocabulary Assessment for Parents (Libertus, Odic, Feigenson, & Halberda, 2015), and the Strengths and Difficulties Questionnaire (Goodman, 1997). After the Zoom session, parents completed two additional surveys: the Social Network Questionnaire (Burke,

2021) and the Dimensions of Mastery Questionnaire (Morgan et al., 2020), to which I appended my help-seeking assessment.

The CBQ and the SDQ were collected to assess children's temperament – their willingness to approach, their prosociality, and general sociality. The CBQ is a well-known and –used assessment of children's temperament (see Putnam & Rothbart, 2006); I was interested in children's temperamental sociality, and so focused on the Shyness subscale (reverse-scored) as other investigators have done (Barcenilla et al., 2021; De Pauw et al., 2009; Gartstein et al., 2012; Hayden et al., 2010; Klein-Tasman & Mervis, 2003; Olino et al., 2013; Rudasill et al., 2014). The SDQ is a validated behavioral screener for typically- and atypically-developing children, assessing children's conduct problems, hyperactivity, peer problems, etc. (Goodman & Goodman, 2009; Goodman, 1997). Of interest to me was the prosocial behavior subscale, which contained five items: Considerate of other people's feelings, Shares readily with other children, Helpful when someone is upset, hurt, or feeling ill, Kind to younger children, and Often volunteers to help others. I extracted the prosociality subscale to determine the relation, if any, between children's willingness to provide help and their propensity to seek out help for themselves. The REEF was collected as a parent report of children's EF abilities; this questionnaire has been validated against laboratory measures of EF, such as Digit Span and Tower of Hanoi (Nilsen et al., 2017). The DVAP assessed children's vocabularies; this survey has been found to have concurrent and predictive validity with children's vocabulary (Libertus et al., 2015). The DMQ measured children's mastery motivation, and has been found to be a valid and reliable assessment of children's mastery motivation (see Morgan et al., 2020); in particular, I focused on the Mastery Pleasure subscales as the other subscales – Gross Motor Persistence, Social Persistence with Adults, etc. – were not relevant to the construct I aimed to tap.

The help-seeking items I appended to the DMQ measured children's willingness to seek help across easy and difficult activities. This help-seeking measure prompted parents to supply up to five activities that their child currently found easy and up to five that their child currently found hard (e.g. tying shoes, buttoning clothes). Then, parents were asked to rate how likely their child was to ask for help or attempt the activity on their own on a scale that ranged between "Certainly would not try on their own and would ask for help" to "Would only try on their own". I transformed these ratings to numerical values with 1 representing least likely to seek help and 5 representing most likely to seek help. I then averaged parents' ratings across the easy activities, difficult activities, and both; overall rate of help-seeking was represented by parents' average ratings across both types of activities, and sensitivity in help-seeking was calculated as the ratio between average ratings on difficult activities and average ratings on easy activities.

## **Results**

In this study, I collected measures of children's social, communicative, cognitive, and social-cognitive abilities in order to investigate potential relations between these areas and help-seeking behavior. To test these potential relations, I ran a series of correlations and linear regressions, outlined below. Additionally, I present descriptive statistics for each of the measures of interest, as well as relations between those measures.

### **Help-seeking measure**

Parents reported a number of activities that their children were currently struggling with or were experts at. The five most frequently cited responses for both easy activities and difficult activities are listed below. Some parents listed activities in the "easy" category that other parents listed at "difficult"; examples of these activities were "riding a bike" and "opening snack packages".

Five most frequently-listed easy activities:

- Brushing teeth
- Using technology (iPad, Netflix, YouTube, etc.)
- Opening snack packages
- Riding a bike
- Buckling into car seat

Five most frequently-listed difficult activities:

- Tying shoelaces
- Using monkey bars
- Reading books
- Opening snack packages
- Riding a bike

Parents reported that their children were seeking help regularly, rating them at a 2.50 on average across all items ( $SD = .52$ , scale from 1-5). Children's help-seeking varied by the difficulty of each activity; parents rated children at a 3.60 on difficult tasks and at a 1.58 on easy tasks – this difference was statistically significant,  $t(64) = -18.51$ ,  $p < .001$ . I calculated help-seeking strategy as the ratio between parent's average ratings of their child's likelihood of bidding for help on difficult and easy activities; this ratio had a mean of 2.5 ( $SD = .85$ ). Propensity to seek help and strategic use of help-seeking were not significantly related to age (all  $ps > .64$ ) or to each other ( $r(65) = -.13$ ,  $p = .32$ ); children's rate of help-seeking was not significantly related to their strategic use of help-seeking.

### **EF measures**

Performance on the EF measures were variable and age-appropriate. See Table 6 for means and SDs for all EF measures. Age in months significantly related to performance on Day-Night Stroop and Head-Shoulders-Knees-Toes, and marginally to the REEF; therefore, age was included as a factor in all later regressions with these tasks. Additionally, performance on the Day-Night Stroop task related significantly to performance on Head-Shoulders-Knees-Toes and Digit span; see Table 7 for a correlation matrix.

**Table 6.** Descriptive statistics of the four EF measures.

	REEF	Day-Night Stroop	Digit span	HSKT
N	64	64	63	58
Mean	2.214	0.540	4.825	0.540
Std. Deviation	0.331	0.301	0.814	0.311

Note: REEF: average score on all REEF items, on a scale from 0-3. Day-Night Stroop: proportion of trials with a correct response on the Day-Night Stroop task. Digit span: number of digits accurately recalled and recited. HSKT: proportion of trials with a correct response on the Head-Shoulders-Knees-Toes task.

**Table 7.** Correlation matrix of the four EF measures.

Variable		Age (months)	Day-Night Stroop	Digit Span	HSKT
Day-Night Stroop	Pearson's r	0.251*	—		
	p-value	0.045	—		
Digit Span	Pearson's r	0.106	0.332**	—	
	p-value	0.408	0.008	—	
HSKT	Pearson's r	0.371**	0.467	0.071	—
	p-value	0.004	< .001***	0.598	—
REEF	Pearson's r	0.215	0.170	0.014	0.387**
	p-value	0.088	0.182	0.913	0.003

Because many of the EF tasks intercorrelated, and a PCA revealed only one significant component on which all four EF measures loaded positively, these measures were z-scored and averaged together to generate a single EF summary score for each participant.

### **Social-cognitive and communicative skills**

I collected one measure of children's communicative abilities (DVAP); two children are missing their DVAP scores as their parents chose not to complete this survey. Children were producing, on average, 109 words (SD = 28.13, range = 53-188), an age-appropriate figure. I

collected two measures of Theory of Mind – the CSUS and a behavioral battery. Children performed or were rated at variable and age-appropriate levels on these assessments; see Table 8 for a descriptive table. Scores on the CSUS and the behavioral ToM task were highly correlated ( $r(63) = .34, p = .007$ ); because of this, and since there was more noise in the behavioral ToM data, I used the CSUS alone as a metric of children’s ToM abilities for the following analyses.

**Table 8.** Descriptive statistics of the Theory of Mind measures.

	CSUS	ToM
N	63	65
Mean	3.280	3.185
Std. Deviation	0.339	1.184

### **Mastery motivation**

Parents reported high levels of mastery motivation in their children, with an average rating of 4.61 (maximum of 5) and a standard deviation of .45.

### **Sociality**

I collected two measures of temperamental sociability (the Shyness scale of the CBQ and the Prosociality scale of the SDQ) and one measure of social-communicative skills (DVAP). One child is missing their scores for the CBQ and two are missing their scores for the SDQ; parents declined to complete these surveys. On a scale from 1 to 7, parents reported that their children were moderately shy ( $M = 3.96, SD = 1.48$ ); on a scale from 0 to 2, parents reported that their children were prosocial on average ( $M = 1.54, SD = .37$ ). Age was significantly related to the Prosocial subscale of the SDQ ( $r(63) = .26, p = .041$ ) and the Prosocial subscale significantly related to the Shyness subscale ( $r(63) = .45, p < .001$ ).

### **Relations between factors**

In order to test for effects of age, and to determine whether any of the factors of interest interrelated, I generated a correlation matrix. This analysis did indeed reveal some interrelations between these factors, some of which have already been discussed. In addition, two factors – Prosociality and EF - were related to child age. See Table 9 for a full correlation matrix between age and the other factors of interest.

**Table 9.** Correlation matrix between age and factors of interest

Variable		Age	EF	ToM	Vocabulary	Shyness	Prosociality	Mastery motivation
1. Age	Pearson's r	—						
	p-value	—						
2. EF	Pearson's r	0.353	—					
	p-value	0.004	—					
3. ToM	Pearson's r	0.174	0.574	—				
	p-value	0.173	< .001	—				
4. Vocabulary	Pearson's r	0.208	0.268	0.328	—			
	p-value	0.102	0.034	0.009	—			
5. Shyness	Pearson's r	-0.073	-0.165	-0.419	-0.114	—		
	p-value	0.568	0.193	< .001	0.375	—		
6. Prosociality	Pearson's r	0.258	0.382	0.551	0.241	-0.447	—	
	p-value	0.041	0.002	< .001	0.057	< .001	—	
7. Mastery motivation	Pearson's r	0.080	0.306	0.504	0.031	-0.336	0.300	—
	p-value	0.529	0.013	< .001	0.807	0.007	0.017	—

### Relations between EF and help-seeking

To investigate potential relations between executive functioning and help-seeking behavior at 5 years, I conducted a linear regression. In this regression, the EF summary score was the DV and children's strategic use of help-seeking and overall propensity to help-seek were IVs. Age was also included as an IV as the EF summary score significantly related to age ( $r(65) = .35, p = .004$ ). The overall regression was significant,  $F(3, 61) = 3.85, p = .014$ . EF scores did not significantly relate to strategic use of help-seeking ( $\beta = .15, p = .12$ ) nor to children's propensity to seek help ( $\beta = .0004, p = .998$ ). Only children's age significantly related to EF;  $\beta = .05, p = .004$ . Children's overall EF abilities did not significantly relate to how much children varied their rate of help-seeking by task difficulty, nor to their propensity to seek help overall.

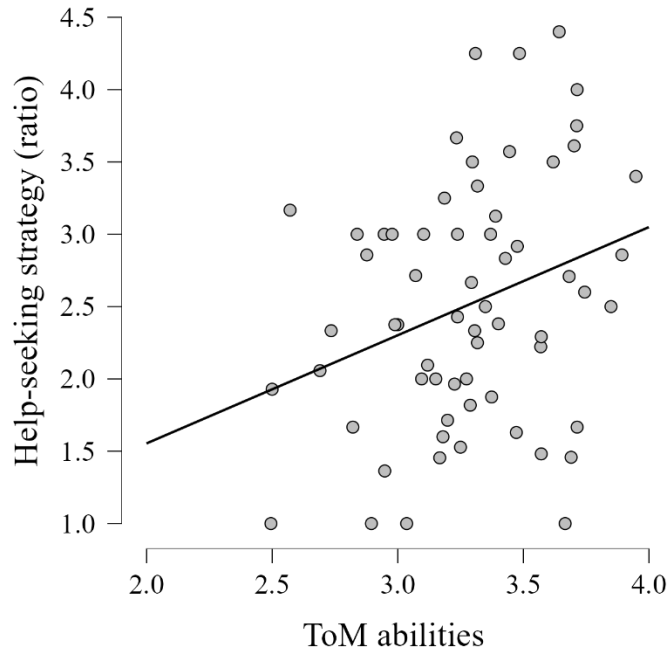
## **Relations between social-cognitive and communicative abilities and help-seeking**

To investigate whether children's propensity to seek help and strategic use of help-seeking related to their ability to take others' perspectives, I ran two correlations between these variables; age was not included as factor as it did not correlate to either aspect of help-seeking or to Theory of Mind. To correct for multiple comparisons,  $\alpha$  level was set to .025 (two comparisons). Children's Theory of Mind skills significantly, positively related to their strategic use of help-seeking ( $r(63) = .30, p = .018$ ; see Figure 4). Children who were more adept at understanding others' beliefs, knowledge, and desires differentiated between easy and difficult tasks more than their peers with worse ToM skills, choosing to seek help most often during tasks that were rated as being challenging by their parents. Children's Theory of Mind abilities also marginally related to help-seeking rate ( $r(63) = -.24, p = .057$ ); children with better ToM skills were less likely to seek help overall than their peers with worse ToM skills.

To assess whether communicative skills related to help-seeking behaviors, I ran correlations between propensity to seek help, strategic use of help-seeking, and vocabulary size; age was not included as a factor since it did not correlate with any of these factors (all  $ps > .10$ ). Vocabulary size did not significantly relate to propensity to help-seek ( $r(63) = -.09, p = .48$ ) or strategic use of help-seeking ( $r(63) = -.13, p = .30$ ). Children's help-seeking was not significantly related to their vocabulary size.



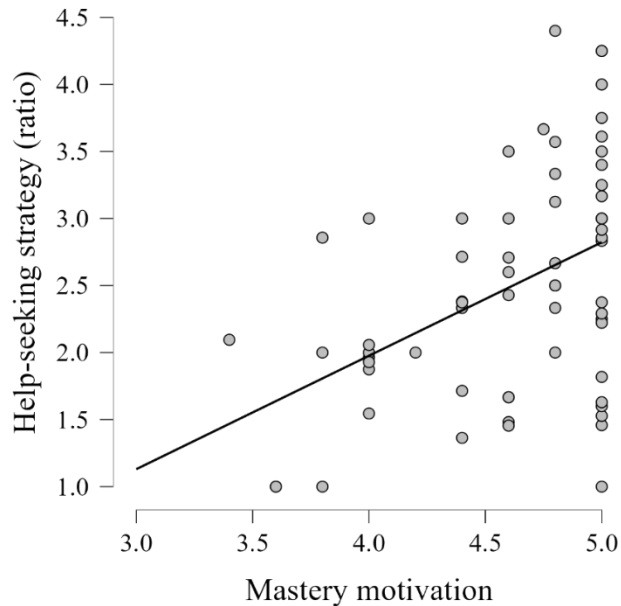
**Figure 4.** Relation between ToM abilities and children’s strategic use of help-seeking.



### **Relations between mastery motivation and help-seeking**

To assess how children’s pleasure in solving problems related to their help-seeking, a linear regression with mastery motivation as the DV and children’s strategic use of help-seeking and propensity to help-seek as IVs was conducted. The overall regression was significant,  $F(2, 62) = 9.06, p < .001$ . While children’s overall propensity to seek help was not significantly related to their mastery motivation ( $\beta = -.16, p = .13$ ), strategic use of help-seeking was ( $\beta = .23, p < .001$ ; see Figure 5). Children that parents rated as taking more pleasure from solving problems on their own were more likely to differentiate between hard and easy problems when choosing whether to seek help.

**Figure 5.** Relation between children’s strategic use of help-seeking and their mastery motivation



### **Relations between sociality and help-seeking**

To assess how aspects of temperament relate to children’s help-seeking behaviors, I ran two linear regressions, with either overall propensity to seek help or strategic use of help-seeking as the DV and the Shyness subscale of the CBQ and the Prosocial subscale of the DMQ as the IVs. For the regression with help-seeking rate as the DV, the overall model was statistically significant ( $R^2 = .12$ ,  $F(2, 60) = 3.89$ ,  $p = .026$ ) and while Shyness did not significantly relate to help-seeking rate ( $\beta = -.01$ ,  $p = .77$ ), Prosociality significantly and negatively related to help-seeking rate ( $\beta = -.48$ ,  $p = .011$ ). Parents rated children with higher Prosocial scores as being less prone to seeking help overall.

For the regression with strategic use of help-seeking as the DV, the overall model trended towards significance ( $R^2 = .072$ ,  $F(2, 60) = 2.34$ ,  $p = .105$ ) and while Shyness did not significantly relate to help-seeking strategy ( $\beta = -.02$ ,  $p = .84$ ), Prosociality marginally and positively related to help-seeking strategy ( $\beta = .25$ ,  $p = .072$ ). Children whose parents rated them as being more prosocial were more likely to seek help strategically than their less-prosocial peers.

## **Longitudinal questions**

Next, I investigated potential longitudinal relations in help-seeking behavior'; unlike in the preceding analyses, only the longitudinal subset of participants ( $N = 32$ ) was included for the following analyses.

### **Relations between help-seeking at 18 months and 5 years**

To probe potential relations between rate of help-seeking at 18 months and 5 years, and strategic use of help-seeking at 18 months and 5 years, I ran two correlations. Rate of help-seeking was not correlated between the two timepoints ( $r(26) = .01, p = .98$ ); a correlation likewise did not support a relation between strategic use of help-seeking between the two timepoints ( $r(21) = .02, p = .96$ ). I failed to find evidence that aspects of children's help-seeking behavior – their propensity to seek help and strategic deployment of help-seeking – are stable between 18 months and 5 years.

### **Relations between vocabulary and EF at 18 months and help-seeking at 5 years**

To assess whether predictors of help-seeking rate and strategy at 18 months – vocabulary size and executive functioning abilities, respectively – similarly predict later help-seeking, two correlations were conducted. A correlation between children's vocabulary at 18 months and help-seeking rate at 5 years did not reveal a significant relation ( $r(25) = -.21, p = .32$ ); neither did a second correlation between children's EF skills at 18 months and strategic use of help-seeking at 5 years ( $r(24) = -.22, p = .31$ ). Factors that have previously been found to relate to help-seeking at 18 months did not significantly relate to help-seeking three years later. Moreover, vocabulary at 18 months did not predict vocabulary at 5 years, nor did executive functioning predict EF at 5 years, both  $ps > .69$ .

## Discussion

My goal for this research was to investigate factors that could theoretically relate to children's help-seeking behaviors – aspects of sociality and cognitive abilities. I examined some variables that are relatively stable across developmental time (temperament), as well as others that develop at rates that vary over time by individual, including language, EF abilities, and ToM skills. In particular, I was interested in relations between these factors and two aspects of help-seeking behavior: rate and strategy. I defined rate as how likely children were to ask for help, and strategy as the ratio between how often children asked for help on hard over easy problems. Additionally, I probed potential longitudinal relations in help-seeking: whether propensity to seek help and strategic use of help-seeking are stable within individuals over time, and whether factors related help-seeking behavior at 18 months – language and EF abilities – predict later help-seeking behavior.

Overall, I found that help-seeking rate was negatively related to Theory of Mind and prosociality. The more likely children were to seek help, regardless of problem difficulty, the worse parents rated them on understanding others' perspectives and being helpful to others. On the other hand, strategic use of help-seeking was positively related to ToM, prosociality, and mastery motivation. Children who strategically asked for help more often during objectively challenging tasks were rated as being better at understanding others' perspectives, being helpful to others, and more likely to enjoy solving problems. However, I did not find evidence that help-seeking behavior is stable between 18 months and 5 years, nor that factors that relate to help-seeking in toddlers were predictive of help-seeking in preschoolers.

While I did not make directional predictions between the factors of interest, it was surprising to me that help-seeking rate did not positively relate to children's propensity to help

others – their prosociality. It is theoretically plausible that children’s ability to understand others’ needs in problem-solving situations - and how help can lead to problem solutions – would relate to their propensity to seek out help for themselves. However, results indicated a broader effect, involving social and social-cognitive factors relating negatively to rate. Indeed, many of these factors were instead positively related to help-seeking strategy. What emerges from these results is the importance of something like overall competence in the preschool years – children who were generally more skilled and independent were more strategic in their help-seeking, while overall seeking help less. I have a small amount of evidence from the literature that suggests that I might have expected to find this result: one study found that high-achieving grade school students tended to be better aware of their need for help than their low-achieving peers, declining to seek help when they were confident in their problem solutions; this skill particularly improved with age (Puustinen, 1998). A few other studies found that help-seeking rates decreased with age – a result of developmental maturation, or perhaps a general increase in competence over developmental time (Geppert & Küster, 1983; Snyder, 2007). As skills in general improve, it appears that help-seeking rates decrease while strategic use of help-seeking increases.

Additionally, many of the factors of interest related to each other across domains: for example, Theory of Mind abilities related to executive functioning skills, a not unexpected result, but executive functioning skills also positively related to children’s prosociality - a surprising finding - and to children’s enjoyment of solving problems. One recent study found that children’s metacognitive abilities related both to their EF and to their persistence on a problem-solving task – hinting at links between executive functioning, mastery motivation, and a critical step in the help-seeking process: awareness of a need for help (Marulis & Nelson, 2021). Social,

cognitive, and social-cognitive skills all feed into children's choices of when and whether to seek help, and this is reflected in links between these areas and help-seeking.

Although I did not find the predicted relations between help-seeking behavior at 18 months and 5 years, nor between language skills and EF and later help-seeking, many factors may have contributed to this lack of significant results. Firstly, only half of this study's sample were from the longitudinal cohort, meaning that I had little power to detect effects in the longitudinal questions. Secondly, many aspects of the tasks and measures differed between the two timepoints; the study with 18-month-olds was conducted in-person, and measures were mostly directly collected from child behavior, whereas data for the current study were collected during COVID-19, and thus primarily consisted of parent reports. Thirdly, help-seeking rate was operationalized in the prior study as the number of times children sought help; in the current study, help-seeking rate was operationalized as how likely parents rated their children as being to seek out help. Help-seeking strategy in the prior study was defined as how long children observed or worked on a problem before seeking help; in the current study, strategy was defined as the ratio between how likely children were to seek help on challenging vs. easy problems. Additionally, help-seeking in the prior study was almost exclusively directed towards the experimenter, while parents reporting on their children's help-seeking propensities were likely recalling times when their children sought help from them; help-seeking and its predictors likely vary by who children are selecting to solicit help from.

Lastly, there are reasons I might not expect to find relations between language and EF measures at 18 months and later help-seeking. Language may have been a more critical factor in toddlerhood, when verbal skills are rapidly developing, as compared to at 5 years, when all typically-developing children possess the verbal capacity to request help. I found a concurrent

relation between an EF task and help-seeking strategy, but not a longitudinal one; it may be that those children who were advanced or delayed in their EF skills at 18 months have fallen behind, caught up, or now place closer to average in performance. Current EF abilities likely matter more in the help-seeking process than do prior ones.

In this study, I examined both stable aspects of personality – temperament – as well as factors that develop at varying rates over developmental time. I found evidence that both kinds of variables contribute to help-seeking, though in unexpected ways in the case of prosociality. Indeed, I also found evidence that both kinds of variables related to each other. These results indicate the rich and complex dynamics between individuals’ constant traits and developing skills, and hint at how these interrelations play out as children employ a complex social and cognitive ability like help-seeking.

In future studies, research may probe my “general competence” hypothesis by examining help-seeking behavior alongside overall measures of ability, such as IQ – although I did not find that EF related to help-seeking behavior, it may be that a more general assessment of cognitive capabilities may link to children’s strategic use of help-seeking. Additionally, research should investigate whether the same predictors of help-seeking behavior I identified also relate to help-seeking not directed to parents in everyday contexts, e.g. in the lab and/or towards experimenters, teachers, etc. – or, indeed, to non-human potential helpers, such as Amazon’s Alexa (what does help-seeking look like when the explicitly social aspect is removed?). Finally, longitudinal predictors of help-seeking would be better examined with a larger sample size and a consistent means of assessing and operationalizing help-seeking behaviors.

In sum: in the current study, I find that help-seeking behavior at age 5 is related to aspects of children's social skills and propensities, as well as their desire to solve problems. However, I do not find longitudinal predictors of later help-seeking.



## **Chapter 4: Spontaneous help-seeking in naturalistic contexts and connections with other social-cognitive and communicative skills**

Study 1 provided evidence about help-seeking that occurs in laboratory settings – in a controlled, scripted scenario in which toddlers were directly asked to solve increasingly difficult problems and their bids for help were not responded to. In contrast, young children collaboratively solve problems in everyday contexts on a regular basis – reaching high objects, operating technology, and completing puzzles and other household games. How does children’s help-seeking emerge naturalistically, and how do parents respond to bids for help? We know from existing work that young children do produce bids for help – many times a day (De Cooke & Brownell, 1995; Honig & Wittmer, 1985; Mosier & Rogoff, 1994b). However, we know little about what individual differences in communicative and cognitive abilities, as well as changes that occur over developmental time, may influence the quality and quantity of young children’s help-seeking. Additionally, we may ask about parents’ responses to help-seeking bids and children’s sensitivity to problems’ objective difficulty. Together, these generate three sets of questions I may investigate.

### **Help-seeking across developmental time**

From the current help-seeking literature, we have some idea how help-seeking behavior – its forms and functions – appear at different ages. However, very little work has examined how any aspect of help-seeking emerges and evolves over development. In the current study, I can investigate what help-seeking looks like, and when it occurs, in an ecologically-valid context, within individuals, across a large swath of developmental time.

Findings on help-seeking rate – specifically, changes in help-seeking rate – vary widely. One study found that help-seeking increased from 6 to 13 months when, in the lab, mothers were

instructed to make a toy out-of-reach or non-functional; another lab-based study found that 24-month-olds sought more help than 18-month-olds in both free play and problem-solving contexts (De Cooke & Brownell, 1995; Mosier & Rogoff, 1994b). One study, in which several parent-child dyads played together in a single lab space, found that children's spontaneous bids for help increased dramatically between 12 and 24 months (Bronson, 1974). Another found that help-seeking increased between 9 months and 2 years, then decreased between 2 and 6.5 years; children in this study were brought to a special room in their school and presented with challenging toys (Geppert & Küster, 1983). Finally, one study, conducted in a preschool where children were presented with a challenging puzzle (and not provided help), reported that help-seeking rate increased over the preschool years, but only for girls (Thompson et al., 2012).

As to how children are strategically employing help-seeking across developmental time, a majority of the existing literature has focused on whether and when children are sensitive to, or metacognitively aware of, the difficulty of problems in comparison to their abilities. Evidence suggests that children are sensitive to problem difficulty from a very young age, asking for help most often when problems are objectively difficult (Goupil et al., 2016; Snyder, 2007; Thompson et al., 2012). In Study 1, I saw that toddlers increased their rate of help-seeking as problem difficulty increased; in Study 2, parents similarly reported that their 5-year-olds asked for help more often when engaging in an activity that was difficult, as opposed to easy, for them to complete on their own. In Study 3, I may examine how children's sensitivity to problem difficulty changes (or does not change) as children age and gain experience, both with solving problems and with eliciting help.

In form, help-seeking initially occurs as open-handed reaches and "gimme" gestures, progressing to pointing and non-verbal vocalizations and then verbal requests (Crais et al., 2004;

De Cooke & Brownell, 1995). Indeed, in Study 1, I saw that the vast majority of help-seeking bids took the form of non-verbal vocalizations (whines or grunts) often paired with a gesture towards the out-of-reach toy.

Lastly, I may consider children's specificity in their help-seeking bids – how clearly children identify a problem and solicit help from a specific potential helper. Some literature has examined children's use of instrumental vs. executive help-seeking – e.g. asking for hints or the next step vs. asking for the solution – but none (to my knowledge) have investigated how children's specificity changes with age. With developmental time, both children's communicative skills and their ability to understand what other people do and do not know should scaffold their effective, specific help-seeking (Newman, 2000). In the current study, I may descriptively examine children's form, rate, and specificity in help-seeking as they age.

Overall, with the data from the current study, I investigate what help-seeking behavior looks like at each time point, as well as how different aspects may relate to each other – in Studies 1 and 2, I did not find that rate and strategic use of help-seeking were related, either concurrently or, in the case of Study 2, longitudinally; might help-seeking rate, specificity, and strategy relate to each other in the current study, where help-seeking behavior was assessed consistently? Specifically, I address the question of how help-seeking behavior changes over time in three ways.

Firstly, I present descriptive statistics at a group level of what help-seeking form, rate, specificity, and strategy look like over time, and how they may change across the three timepoints. I predict that help-seeking forms – the number of communicative techniques children employ when seeking help - is highest at the youngest age, involving gaze, gestures or communicative actions, as well as vocalizations, whereas older children rely primarily on

speech. As children age, their ability to communicate effectively improves; therefore, I predict that average specificity of bids increases with age. In regard to rate, based on the existing literature, I predict that the youngest and oldest children seek help less frequently than 3-year-old children. I do not predict age-related changes in help-seeking strategy; rather, I predict that this factor relies on individual differences in children's metacognitive awareness of their own abilities and their willingness to engage in social interactions.

Next, to evaluate whether any aspects of help-seeking behavior are related to each other at each age, I run correlations between help-seeking form, rate, specificity, and strategy within each timepoint. These correlations are exploratory; the existing literature does not probe interrelations between different aspects of help-seeking. From Studies 1 and 2, I may hypothesize that help-seeking rate and strategy will not relate. Other relations can be posited; for example, bids that are more specific in context may require fewer features (forms) in order to elicit a response. Children who are more specific in their help-seeking bids, eliciting help on a certain aspect of a problem from a named potential helper, may be more strategic in general, choosing to seek help on problems that are objectively difficult. Children who are less specific on average, on the other hand, may need to seek help more frequently in order to effectively elicit their desired help.

Lastly, to assess whether aspects of help-seeking behavior remain stable within individuals across developmental time, I run correlations within each aspect for each time point (e.g. relating rate at Time 1 to rate at Times 2 and 3). As discussed above, I predict that two aspects of help-seeking behavior – form and rate – shift with age and thus are not stable across my timepoints of interest. Alternatively, specificity and strategy may be aspects of help-seeking

that relate to aspects of children's cognitive and social skills, and those aspects may remain stable within individuals across developmental time.

### **Responses to help-seeking**

While we have some evidence about the nature of children's help-seeking from the existing literature, almost no work has investigated what naturalistic responses to these bids look like. Parents' scaffolding behaviors during problem-solving have been found to relate to children's success at those problems, as well as their executive functioning more broadly (Brezack et al., 2021; Hammond et al., 2012; Mondell & Tyler, 1981). The ways in which parents respond to a child's challenges impact not only the child's success on specific problems, but also may influence how and when they choose to ask for help on future problems (De Cooke & Brownell, 1995; Newman, 2000; Thompson et al., 2006). Parents who rarely respond to bids for help and parents who jump to provide help (sometimes before it is even requested) may have children who rarely produce bids for help. Alternatively, parents who vary their responses based on their knowledge of their children's independent skills may optimally scaffold children's help-seeking, and their children may seek help often and on a variety of problems.

Existing literature provides us with some idea of how people in children's environment – most often parents – can influence help-seeking behavior. One study found that mothers' scaffolding and emotional support during problem-solving predicted rates of help-seeking in school a year later; children whose mothers who provided hints and warmth during problem-solving were more likely to seek help from a teacher when they were struggling in the classroom (Neitzel & Stright, 2003). A second study found that, for girls, parental warmth and nurturance predicted longer thinking times preceding help-seeking, and better-quality help-seeking bids (Puustinen et al., 2008). In this study, I may ask: how do parents respond to children's bids for

help? Are there variations by household, child age, and necessity of bid? Moreover, I expand the view of potential helpers to include siblings, the experimenter filming the home session, and anyone else in each child's house. Further, how do parents' responses to children's bids relate to children's rate of help-seeking? Theory and preliminary evidence suggest that both under- and over-responsiveness will relate to reduced help-seeking. By evaluating how bids for help are responded to – from being ignored to immediately answered – I may probe how the feedback children receive in response to their bids impacts their concurrent and later help-seeking.

I am interested in both how children's behavior influences parental responses, as well as how parental responses influence children's later behavior. To investigate these questions, I first run correlations between children's help-seeking behavior and parent responses concurrently at each age point, with parents' average responsiveness as the dependent variable and children's rate, specificity, and strategy as independent variables. Next, I predict children's help-seeking rate at Times 2 and 3 from parents' average responsiveness at Times 1 and 2, respectively; if concurrent relations are found, I control for those factors at the prior timepoint (e.g. if help-seeking necessity relates to parents' responsiveness at Time 1, I add necessity at Time 1 when I predict children's help-seeking rate at Time 2 from parents' responsiveness at Time 1). Finally, I use children's behaviors at Times 1 and 2 to predict parent responsiveness at Times 2 and 3, respectively, with parent responsiveness at a certain timepoint as the dependent variable and children's rate and strategy at the following timepoint as independent variables.

### **Relating help-seeking behavior to individual differences in cognitive and communicative skills**

In Study 1, I found that language related to help-seeking behavior in 18-month-olds. In Study 2, I found that Theory of Mind abilities, among other aspects of development and

personality, related to help-seeking behavior in 5-year-olds. I did not find longitudinal relations between help-seeking or its predictors at 18 months and later help-seeking behavior; however, there were many methodological differences between these two studies.

In this study, I have the opportunity to examine spontaneous, naturalistic behavior in an ecologically-valid context: free play, in children's homes, across 60-minute sessions. Surveying families in this context and for a substantial amount of time, in this case 60 minutes, tends to deliver reliable and valid data on families' daily lives (Puustinen et al., 2008). In addition, I can examine naturalistic behavior across developmental time; specifically, I coded videos from when children were 14 months, 38 months, and 58 months old. With these longitudinal data, I may answer questions generated by the prior two studies.

Does language predict help-seeking behavior specifically at younger ages? Vocabulary predicted rate of help-seeking in 18-month-olds, but this relation was not present at five years. I argued that while developing communicative skills are critical for early help-seeking bids, by age 5 all typically-developing children have the vocabulary to successfully elicit help. Meanwhile, though vocabulary was did not significantly relate to rate of help-seeking at age 5, both help-seeking rate and strategy at this age were predicted by another social-cognitive skill – Theory of Mind. As children age, communicating a need for help becomes easier and more ubiquitous – it may be that individual differences in help-seeking behavior later in development relate to more children's emerging social-cognitive abilities than to communicative skill. Using data from the current study, I may ask: do different factors relate to help-seeking behavior at different ages? Specifically, does vocabulary predict rate of help-seeking at 14 months, and Theory of Mind abilities predict rate and strategy at 58 months? Additionally, which of these factors relate to help-seeking at an intermediate age – 38 months?

In Study 3, can I replicate my previous findings that communicative skills and social-cognitive abilities relate to help-seeking behavior at different timepoints? To assess these questions, I first run correlations between language abilities and help-seeking rate at each age point. Then, I run correlations between Theory of Mind skills and help-seeking rate and strategy (necessity) at each age point.

### **The current study**

In this study, I coded naturalistic videos for instances of spontaneous help-seeking. These videos are 60-minute-long recordings of children – aged 14, 38, and 58 months - and their families in their homes, and were collected as part of a larger, longitudinal study (the Language Development Project). A subset of 18 children were selected for this project; these children had no missing sessions, represented the full range of verbal ability in the dataset, and were representative of the demographic diversity in Chicago (for more details, see Method). This small group was chosen to ensure that I could conduct intensive, detailed coding of the hour-long videos across three age points; three age points were chosen so that I could detect and describe developmental shifts in help-seeking behavior.

Over the course of the Language Development Project, many outcome measures were collected in addition to the naturalistic recordings – including measures of executive functioning, language, and social cognition – making this dataset well-suited for my questions of interest. My goal is to identify naturally-occurring instances of help-seeking, and then to investigate whether variation in frequency and sensitivity in help-seeking relates to children’s cognitive and communicative development. Additionally, I aim to further our general understanding of spontaneous help-seeking – how often it occurs, its forms and attributes, and the responses children receive after seeking help.



Once a bid of help-seeking is identified, coders assigned a rating of how necessary the bid was (does the problem appear objectively easy or difficult?), how specific the bid was in context (from nonspecific whining to a clear request for particular help) and also count the number of bids produced over a 60-minute session, thus obtaining metrics of these children's frequency and sensitivity of help-seeking. After these critical ratings, coders additionally identified aspects of each bid to create a more general understanding of everyday help-seeking: who the help-seeking bid was directed at and how the bid was responded to (on a scale from being missed or ignored to immediate and complete help being provided). Some children rarely ask for help at all; others make frequent bids to multiple social partners, including the experimenter filming the session (similar to Study 1, where the majority of bids were directed at the experimenter).

With these measures, I examine the development of help-seeking behavior using several strategies. First, I describe the ways in which help-seeking form, rate, specificity, and strategy emerge and evolve over the first 5 years of life. Second, I investigate the ways in which parental responses influence concurrent and later help-seeking behavior. Third, in regard to replicating findings from Studies 1 and 2, I predicted that vocabulary would relate to help-seeking rate at 14 months, and Theory of Mind abilities will relate to help-seeking rate and strategy at 5 years. Additionally, I explore which, if any, of these factors relate to help-seeking at 3 years, as well as the degree of stability inherent in help-seeking behavior across the three timepoints.

## **Method**

### *Participants*

Participants were 18 children (10 male) drawn from a larger longitudinal study of language development. These children were selected from a larger pool based on prior work

(Cartmil et al., 2014); they were identified as being representative of a broad range of verbal ability (highest, lowest, and median MLUs across multiple observation sessions), and these children had no missing sessions. Moreover, these children were demographically diverse; income in this sample ranged from less than \$15,000 to more than \$100,000 per year, and maternal education ranged from less than a high school diploma to graduate or professional degree. See Table 10 for complete demographic information.

**Table 10.** Demographic information on participants in this study.

Participant gender	Maternal education level	Participant race/ethnicity	Household income	Age at Visit 1 (months; average (standard deviation))	Age at Visit 2 (months; average (standard deviation))	Age at Visit 3 (months; average (standard deviation))
<b>10 male, eight female</b>	Some High School: 1 (5.5%)	White: 11 (61%)	<\$15,000: 1 (5.5%)	14.09 (.26)	38.24 (.37)	58.31 (.65)
		Black or African-American: 4 (22%)	\$15,000-\$34,999: 3 (17%)			
	High School or GED: 1 (5.5%)	Hispanic: 1 (5.5%)	\$35,000-\$49,999: 2 (11%)			
	Some College or Trade School: 4 (22%)	Bi- or multi-racial: 2 (11%)	\$50,000-\$74,999: 4 (22%)			
	Bachelor's Degree: 7 (39%)		\$75,000-\$99,999: 4 (22%)			
	Advanced Degree: 5 (28%)		>\$100,000: 4 (22%)			

### *Procedure*

Every four months from 14 to 58 months, researchers visited families in their homes and recorded them for 90 minutes. Of those 90 minutes, 60 were dedicated exclusively to free play; these portions of each session were coded for instances of help-seeking behavior. During the free play portions of each session, families were encouraged to behave as they normally would and to ignore the researcher.

### *Measures*

*Help-seeking.* Four coders were trained in identifying help-seeking bids and four aspects of each bid (necessity, specificity, response, and features included). Of the total 54 sessions, 11

(20.1%) were double-coded for reliability. Reliability for the measures of interest ranged between moderate (ICC estimate = .733 with a 95% confidence interval from .54 to .89) to excellent (ICC estimate = .944 with a 95% confidence interval from .88 to .98); see Table 11 for full ICC details.

**Table 11.** Full reliability results for each aspect of help-seeking.

<b>Help-seeking aspect</b>	<b>ICC estimate</b>	<b>95% confidence interval lower bound</b>	<b>95% confidence interval upper bound</b>
<b>Number of bids</b>	.733	.536	.886
<b>Necessity</b>	.772	.593	.905
<b>Specificity</b>	.896	.796	.959
<b>Response</b>	.788	.617	.912
<b>Number of features</b>	.944	.884	.979

Coders first identified that a help-seeking bid had occurred; help-seeking was differentiated from information-seeking and general requests by judging whether or not the child was struggling with a task or activity and requesting help in order to achieve a goal. Once a bid was identified, coders then rated how necessary the bid was, from 1 (certainly unnecessary) to 4 (certainly necessary); coders based their ratings on how long a child attempted the task at hand or how physically difficult the task appeared (e.g. child was reaching for an object on a shelf clearly too high for them). Coders then rated how specific the bid was in context, that is, how clearly the child elicited precise help from a certain potential helper; this rating ranged from 1 (non-verbal looking or whining) to 4 (specific need and helper clearly identified). Because both need and potential helper could be identified via nonverbal means (e.g. pointing to a parent and pointing to a distal object), even pre-verbal children could potentially be completely specific – though we did not observe instances where children at 14 months did so. Then, coders rated parents’ responses to their child’s bid on a scale from 1 (parent says no or ignores bid) to 4 (parent is

already moving to help before request is finished). Finally, coders identified how many communicative features (eye gaze switching between the problem and the potential helper, gestures/actions that elicit attention or indicate the problem, and/or vocalizations) each bid included.

*Activity coding.* At the age point of 38 months only, I took advantage of a previous coding effort in which children’s activities (print media, pretend play, eating, etc.) were identified throughout the session (Frausel et al., 2020). In order to limit time in which children likely rarely ask for help, I used this coding to exclude minutes from the session time in which children were engaged with electronic media, resting, and when the activity was labelled as “unstructured” (often indicating children were wandering between activities). After I had, for each three-year-old, a number of session minutes in which help-seeking might more often occur, I used that number of minutes as a denominator and number of help-seeking bids as a numerator in order to calculate a rate-per-minute measure of help-seeking. This rate-per-minute measure somewhat empowered me to normalize rate across families, some of whom spent extensive time in contexts that would rarely elicit help-seeking.

*Individual differences measures.* Assessments were drawn from the same longitudinal study as the video sessions. To evaluate relations between help-seeking and children’s verbal ability, EF, and Theory of Mind skills, I drew on five different assessments: the CDI (Communicative Development Inventory; Fenson et al., 1994) at 14 months, the PPVT (Peabody Picture Vocabulary Test; Dunn, Dunn, & Bulheller, 2003) at 42 months (to approximate verbal ability at 38 months), the PPVT at 54-58 months, a Forward Digit Span task at 38 months (drawn from the WISC; Kaufman & Lichtenberger, 2000), and a Theory of Mind behavioral battery at 58 months (Wellman & Liu, 2004). For means and SDs for each of these tasks, please see Table

12. One participant did not have a PPVT assessment for 54-58 months age point; two participants did not complete the Digit Span task at 38 months; four participants did not have Theory of Mind scores from their 58-month visit; 12 participants did not have CDI data at 14 months. Due to the degree of data missing from the 14-month CDI assessment, this measure was dropped from the following analyses.

**Table 12.** Descriptive statistics for the individual differences assessments.

	<b>CDI (14 months)</b>	<b>PPVT (42 months)</b>	<b>PPVT (54-58 months)</b>	<b>Digit Span (38 months)</b>	<b>ToM (58 months)</b>
N	6	18	17	16	14
Mean	29.83	55.17	73.47	5.00	2.07
Std. Deviation	30.08	16.38	19.83	2.78	1.07

## Results

Analyses for this study were divided into the three sets of questions of interest: the nature of help-seeking behavior over longitudinal time, relations between help-seeking and parental responsiveness, and relations between individual differences in communicative, cognitive, and social-cognitive skills and help-seeking behavior.

### **Set 1: Help-seeking behavior over developmental time**

I address the question of how aspects of help-seeking behavior emerge longitudinally in three ways. First, I will present descriptive statistics at a group level of what help-seeking form, rate, specificity, and strategy looked like overall, as well as how they changed across the three timepoints. Next, to evaluate whether any aspects of help-seeking behavior related to each other at each age, I will present correlations between help-seeking form, rate, specificity, and strategy within each timepoint. Lastly, to assess whether aspects of help-seeking behavior remain stable

within individuals across developmental time, I will present correlations within each aspect for each time point (e.g. relating rate at Time 1 to rate at Times 2 and 3).

Help-seeking occurred in 42 of the 54 sessions (78%); in total, 186 bids were identified. Children produced an average of just over three bids per session, and every child produced at least one bid across their three sessions. The specificity and necessity of bids were relatively high on average, indicating that children were, most often, asking for help in specific ways and at times when help was truly needed. Bids included, on average, 1.62 communicative features (eye gaze switch, gesture/action, and/or vocalization).

Next, I examine change in aspects of help-seeking behavior over developmental time. Means and standard deviations for each feature, split by age, are presented in Table 13.

**Table 13.** Descriptive statistics for each aspect of help-seeking behavior, split by age.

	Number of help-seeking bids			Specificity			Necessity			Number of features in bid		
	14	38	58	14	38	58	14	38	58	14	38	58
Mean	2.89	5.00	1.78	1.77	3.32	3.86	3.66	2.96	2.71	1.75	1.46	1.69
SD	3.38	3.96	1.88	0.49	0.57	0.29	0.40	0.57	0.98	0.53	0.41	0.60

One-way ANOVAs were performed to test for the effect of age on my aspects of interest: number of help-seeking bids, the average specificity and necessity of bids, and the average number of features included in each bid. These ANOVAs revealed a significant effect of age on rate of help-seeking ( $F(2, 51) = 4.74, p = .013$ ). Follow-up Tukey’s HSD Tests for multiple comparisons found that help-seeking rate was significantly higher at 38 months than at 58 months ( $p = .011, 95\% \text{ C.I.} = 0.66, 5.79$ ); there was no statistical difference between help-seeking rate at 14 and 38 months ( $p = .13$ ) and 14 and 58 months ( $p = .55$ ). Help-seeking rate peaked at 38 months, as predicted.

ANOVAs also revealed an effect of age on average specificity in each bid on average ( $F(2, 39) = 68.34, p < .001$ ), as predicted. Follow-up Tukey's HSD Tests for multiple comparisons found that help-seeking specificity was significantly higher at 58 months than at 14 ( $p < .001, 95\% \text{ C.I.} = -2.09, -2.54$ ) and 38 months ( $p = .009, 95\% \text{ C.I.} = -0.54, -0.96$ ), and that specificity was significantly lower at 14 months than at 38 months ( $p < .001, 95\% \text{ C.I.} = -1.55, -1.99$ ). As predicted, children's ability to specify both a particular problem and potential helper improved across developmental time.

An ANOVA additionally revealed an effect of age on average necessity in each bid on average ( $F(2, 39) = 6.25, p = .004$ ). Follow-up Tukey's HSD Tests for multiple comparisons found that help-seeking necessity was significantly higher at 14 months than at 38 ( $p = .034, 95\% \text{ C.I.} = 0.04, 1.34$ ) and 58 months ( $p = .004, 95\% \text{ C.I.} = 0.28, 1.61$ ); there was no significant difference in average bid necessity between 38 and 58 months ( $p = .59$ ). Raters coded bids as being most necessary at 14 months.

Lastly, an ANOVA did not detect significant changes in the average number of features each bid contained across age points ( $F(2, 39) = 1.25, p = .30$ ). While the average number of features per bid did not significantly shift over time, this aspect was lowest at 38 months descriptively. Types of features used in bids (eye gaze switch, gesture, vocalization) likewise did not significantly change with age (lowest  $p$ -value = .33), contrary to my predictions; see Table 14 for descriptive statistics on features included in bids, split by age.

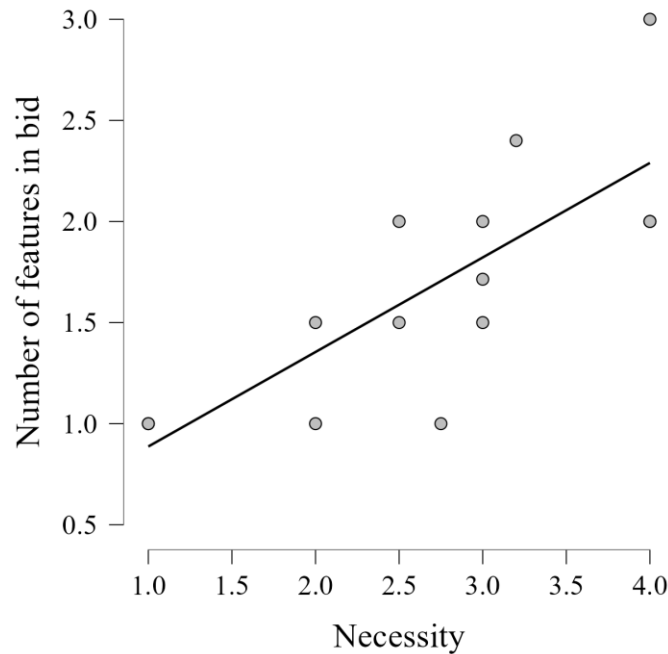
**Table 14.** Descriptive statistics on the proportion of bids that contained each feature, split by age.

	Proportion of bids containing gaze switch			Proportion of bids containing gesture			Proportion of bids containing vocalization		
	14	38	58	14	38	58	14	38	58
Mean	0.296	0.153	0.306	0.504	0.310	0.381	0.946	1.000	1.000
Std. Deviation	0.352	0.211	0.369	0.429	0.327	0.444	0.146	0.000	0.000

Next, I investigated whether different aspects of help-seeking were concurrently related. To test for relations between aspects of help-seeking that may emerge at each age, correlations were run; to correct for multiple comparisons, the  $\alpha$  level was set to .008 (six comparisons per age point). At this  $\alpha$  level, only one relation at any age reached statistical significance (all other  $p$ s > .033): at 58 months, necessity positively related to the number of aspects per bid ( $r(14) = .77$ ,  $p = .001$ ; see Figure 6). At five years, children who tended to ask for help when it was most necessary also included more features in their bids than did children who asked for help when they might have solved the problems on their own. Other than this relation, no two aspects of help-seeking behavior related to each other.



**Figure 6.** Relation between children’s average number of features per bid and average necessity of bids.

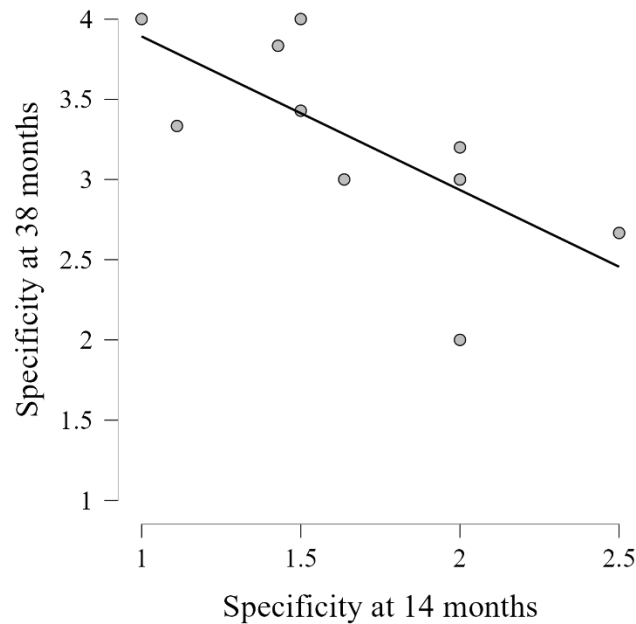


On a trial-by-trial level, at 14 months, specificity positively related to how many features each bid included ( $F(1, 11.69) = 23.84, p < .001$ ). At the same  $\alpha$  level as above (.008), no other significant relations emerged at 14, 38, or 58 months (all  $ps > .032$ ).

To investigate whether any aspects of help-seeking behavior were stable within individuals across developmental time, correlations within each aspect across the three age points were run; to correct for multiple comparisons, the  $\alpha$  level was set to .017 (three comparisons per aspect). No longitudinal relations within help-seeking rate, necessity, or average number of features emerged. One relation was found within specificity; specificity at 14 months negatively related to specificity at 38 months ( $r(11) = -.71, p = .014$ ). The more specific a child typically was in their bids at 14 months, the less specific they were on average at 38 months; see

Figure 7. We did not find evidence that average number of features and rate of help-seeking were stable across developmental time, as predicted. However, we did not find evidence for the predicted individual stability in help-seeking rate.

**Figure 7.** Relation between specificity at 14 and 38 months.



## Set 2: Relations between help-seeking and parental responsiveness

Parents' responsiveness was variable, with an overall mean of 2.32 (between "try again on your own" and providing help after the bid) and an SD of .77; SDs for individual parents ranged from 0 to 1. Average responsiveness did not change with children's age,  $F(2, 39) = .335$ ,  $p = .72$ .

To investigate the question of how children's help-seeking relates to parents' responsiveness – and vice versa - I first present correlations between children's average help-seeking behavior and parent responses concurrently at each age point, with parents' average responsiveness as the dependent variable and children's rate and strategy as independent

variables. Next, I will predict children's help-seeking rate at Times 2 and 3 from parents' average responsiveness at Times 1 and 2, respectively; if concurrent relations are found, I will control for those factors at the prior timepoint (e.g. if help-seeking necessity relates to parents' responsiveness at Time 1, I will add necessity at Time 1 when I predict children's help-seeking rate at Time 2 from parents' responsiveness at Time 1). Finally, I will use children's behaviors at Times 1 and 2 to predict parent responsiveness at Times 2 and 3, respectively, with parent responsiveness at a certain timepoint as the dependent variable and children's rate and strategy at the following timepoint as independent variables.

First, I examine concurrent relations between two aspects of children's help-seeking behavior (rate and necessity) and parent responsiveness. I removed instances where responses were 1s (parent ignores or says no to bid) as children sometimes would have goals that parents did not want to help them accomplish (e.g. reaching for something that was purposefully on an out-of-reach shelf). In order to more accurately gauge parents' responsiveness to their children's bids, I analyzed data including averaged data for responses above 1 only. To correct for multiple comparisons, the  $\alpha$  level was set to .008 (six comparisons total). No factors significantly related to parents' responsiveness at 14 months (all  $p$ s > .02) or 38 months (all  $p$ s > .099). At 58 months, the number of help-seeking bids that children produced negatively related to parent responsiveness ( $r(8) = -.93, p < .001$ ); the more often children sought help from their parents, the less responsive their parents were on average (i.e. more likely to respond with "try again on your own" rather than moving quickly to help), or children with less-responsive parents sought help more often than did children with more-responsive parents.

Next, I explore whether parents' responsiveness predicted two key aspects of children's later help-seeking behavior: rate and necessity. Parent responsiveness at 14 months did not

predict children's rate of help-seeking at 38 months ( $F(1, 7) = .25, p = .63$ ) nor their average necessity rating at that age ( $F(1, 7) = .34, p = .58$ ); neither did parent responsiveness at 38 months predict rate of help-seeking at 58 months ( $F(1, 14) = .822, p = .38$ ) or their average necessity rating at that age ( $F(1, 6) = .069, p = .80$ ). How responsive parents were to their children's bids for help at certain timepoints did not predict children's propensity to seek help, nor how necessary those bids were, at later timepoints.

Lastly, I investigate whether aspects of children's help-seeking behavior predicted parents' responsiveness at later timepoints. First, I ran correlations between parent responsiveness at 38 months and aspects of help-seeking (rate and strategy) at 14 months; to correct for multiple comparisons, the  $\alpha$  level was set to .025 (two comparisons). At this  $\alpha$  level, no relation reached statistical significance (all  $ps > .61$ ). The same process was conducted with parent responsiveness at 58 months and aspects of help-seeking at 38 months; again, no relation was significant (all  $ps > .078$ ).

Overall, I found some concurrent relations between children's help-seeking behavior and parents' responsiveness, but no longitudinal relations. At 58 months, how often children requested help negatively related to parents' responsiveness. However, earlier help-seeking behaviors did not predict later responsiveness, nor did earlier responsiveness relate to later rate of help-seeking.

### **Set 3: Relations between individual differences in communicative, cognitive, and social-cognitive skills and help-seeking behavior**

Based on the findings from Studies 1 and 2, I had specific questions about how individual differences in children's communicative, cognitive, and social-cognitive skills might relate to help-seeking behavior. I have some evidence that vocabulary and EF should relate to help-

seeking rate and necessity respectively at 18 months; since these measures were available at 38 months, I ran correlations between these measures at this age point. Also, from Study 2, I have reason to believe that Theory of Mind abilities would relate to help-seeking rate and necessity at 5 years; therefore, I ran correlations between these measures at 58 months.

No relation between EF (Digit Span task) and help-seeking necessity emerged ( $p = .61$ ) at 38 months, nor was there a significant relation between vocabulary (PPVT) and help-seeking rate at this age ( $r(18) = .36, p = .14$ ). However, when using the rate-per-minute measure of help-seeking (determined by excluding times when children were unlikely to seek help, in order to somewhat normalize rate across families), a significant relation did emerge at 38 months between vocabulary and rate of help-seeking ( $r(18) = .49, p = .037$ ). Three-year-olds with larger vocabularies also sought more help than did their peers with smaller vocabularies. At 58 months, no relations between Theory of Mind abilities and help-seeking behavior emerged, all  $ps > .24$ .

Overall, while I found a predicted relation between vocabulary and rate of help-seeking at three years, I otherwise failed to conceptually replicate previous findings of relations between children's communicative, cognitive, and social-cognitive skills and their help-seeking behavior.

## **Discussion**

In this study, I aimed to investigate the emergence of help-seeking behavior longitudinally. How do different aspects of help-seeking appear at different ages? How might these aspects relate to each other? Are some aspects stable within individuals across time? Further, how does children's help-seeking behavior relate to parents' responsiveness? Lastly, what individual differences in cognitive, communicative, and social-cognitive skills relate to help-seeking behavior at different ages?

Overall, I saw that help-seeking behavior occurred in most sessions. Help-seeking behavior shifted over developmental time; children's rate of help-seeking peaked at 38 months, while specificity was highest at 58 months and strategic use of help-seeking was highest at 14 months. At 14 months, specificity positively related to how many features each bid included, and at 58 months, necessity positively related to how many features each bid included. Children's average specificity at 14 months negatively predicted how specific their bids were on average at 38 months.

While I found that children's rate of help-seeking negatively related to parents' responsiveness at 58 months, no longitudinal relations between responsiveness and children's rate and strategic use of help-seeking emerged. Finally, I investigated whether individual differences in children's cognitive, communicative, or social-cognitive abilities related to their help-seeking behavior; a positive relation between help-seeking rate and vocabulary emerged at three years.

Children employed help-seeking while solving problems differently as they aged. At the earliest timepoint, 14 months, children tended to ask for help only when it was most necessary. How strategic children were decreased across age, surprisingly; rather than electing to ask for help only when it was most needed, children increasingly sought help even on problems that they might have solved on their own. It may be that very young children are still becoming accustomed to actively requesting help from others when tackling their problems, and therefore rely on this behavior only in situations where help is most needed. Older children, on the other hand, are becoming more skilled at eliciting help from desired helpers and specifying exactly the help they need, and therefore are more comfortable using this tool even in situations where they may have eventually been able to come to a solution on their own. Alternatively, it may be that

the problems children spontaneously chose to tackle were generally most difficult for the youngest children, resulting in higher necessity/strategy ratings. Along similar lines, raters may have overestimated children's capabilities as age increased. Future researchers may endeavor to test for evidence of coders' bias, perhaps by asking individuals blind to the study to rate each bid's necessity.

How often children sought help was highest at three years, at an average of five bids per session – two more than the average rate at 14 months, and three more than at 58 months. What is unclear from the current study is whether this peak was due to developmental shifts in how children were using help-seeking or because children engaged in “optimal” situations for help-seeking – anecdotally, collaborative activities such as art or puzzles – more often at 38 months than at the other two ages. It may be that children at 14 months are still learning that they can seek help when they need it (rather than waiting for help to come or simply giving up on difficult activities); at 58 months, meanwhile, children may have a strong desire to accomplish tasks on their own, resulting in the lowest rate of help-seeking of the three age points (Geppert & Küster, 1983). Alternatively, it may be that three-year-old children are more often in contexts that generate opportunities for help-seeking – perhaps factors like types of activities engaged in and which social partners are in the room, available to help, change developmentally. For example, younger children may be more likely to have an adult in the room to seek help from, whereas older children may spend more time moving through their environments and playing alone. Evidence for the importance of context coding comes from the rate-per-minute finding – a relation between rate and vocabulary only emerged at three years when I related vocabulary to the rate-per-minute measure of help-seeking rate, in which time spent in activities that rarely elicit help-seeking were excluded. Future researchers may, in addition to my coding, code the

activity and social contexts surrounding bids for help, potentially excluding time that is non-optimal for help-seeking in order to normalize rate between families and across age points.

Children's average specificity increased with age; children's ability to elicit attention from specific helpers and indicate precise problem areas increased over time. While I coded specificity in such a way that children from any age could be equally specific (e.g. a nonverbal vocalization with a gesture from a 14-month-old could be just as specific as full sentence from a 58-month-old), I nonetheless found what I predicted: children's ability to communicate effectively, regardless of medium, improves over development.

Few relations emerged between different aspects of help-seeking emerged – a result that I partially predicted from my prior lack of evidence that help-seeking rate and strategy correlate. Three relations did emerge: first, at 14 months, specificity positively related to the number of features children used in their bids. At this age, very few children have the verbal capacity to efficiently and effectively elicit and direct help; instead, 14-month-olds use gestures and gaze along with vocalizations when seeking help.

Second, at 58 months, necessity positively related to the average number of features children used in their bids. Children who tended to strategically ask for help when help was most needed also tended to employ multiple communicative features in their bids. By five years of age, children used more means of attracting social partners' attention when help was really needed, a behavior that may be more adult-like (e.g. gesturing, making eye contact, and verbalizing when confronted with a difficult task).

Third, specificity at 14 months negatively related to specificity at 38 months. Interpretation of this finding is less straightforward, and the narrow window of the range of specificity at 14 months should be noted (1-2.5, as compared with the range at 38 months: 1-4).



It may be that children who are highly specific at 14 months – relying on effective use of gaze and gestures, as well as vocalizations – have since shifted to primarily verbal requests, and lost some degree of specificity in the process.

Relevant to these findings, and the following results, an important limitation should be noted: I was limited in my ability to detect potential relations by my restricted sample size. While limiting my sample to 18 allowed me to conduct detailed coding on a set of children across three age points, this small sample also clearly decreased my power. An additional limitation, as touched on earlier, is that experimenters did not dictate what families should be doing during the hour-long recording. While this is also a strength of this study, as I am interested in children’s spontaneous, naturalistic help-seeking, it also meant that some families were rarely in contexts where help-seeking is likely to occur – for example, some children spent long amounts of time watching TV, eating, or at a playground.

I investigated whether and how parents’ responses and children’s help-seeking behaviors related to each other. I found one relation: help-seeking rate negatively related to parents’ responsiveness at 5 years; children this age who asked for help frequently tended to get “lower” parent responsiveness (e.g. more directions to try again on their own, etc.) than did children who sought for help more rarely – these children were more likely to have parents who responded with help right away. I expected that some longitudinal relations between responsiveness and children’s help-seeking rate or strategy should emerge – e.g. parents who are more responsive at an earlier timepoint might have children who rely on help more often later on, or children who are more strategic at one timepoint might elicit a higher degree of responsiveness from their parents later on); however, I did not find evidence for any. It may be that the relations between

children's help-seeking and parent responsiveness are highly situational, and the contexts children engaged in were not consistent enough across timepoints to detect relations.

Lastly, I investigated whether aspects of children's help-seeking were related to individual differences in their cognitive, communicative, or social-cognitive skills, aiming to partially replicate my previous findings. I found some support for my hypotheses; vocabulary size and rate of help-seeking were significantly related at three years. I did not find evidence for my other predicted relations. It may be that these relations are genuinely nonexistent; however, a more likely issue is my limited sample size, particularly for some of the individual differences measures. Additionally, as previously noted, children's activities and social contexts varied widely; changes in the amount of opportunity children had to seek help may account for my lack of ability to detect relations between help-seeking behaviors and individual differences in children's related skills. Future researchers may exclude times when children were in contexts where little help-seeking tends to occur, to generate a "rate per minute" score which may more accurately represent children's rate of help-seeking.

Future researchers may code more children from the existing dataset I pulled from, increasing their power to detect relations while also coding additional details about the context in which help-seeking occurs. In doing so, they may investigate in which situations in the home – collaborative activities, solo toy play, eating, etc. – help-seeking tends to occur most often, and then may construct these situations when recording new families in order to obtain semi-naturalistic, optimal data on children's spontaneous help-seeking. Moreover, the non-significant correlations in this study were found to have Bayes factors close to 1, providing no evidence for the null hypothesis – these nulls were likely due to limited power. In future work, increased sample size may address this issue, and also help detect relations between children's emerging

EF, communication, and perspective-taking skills and different aspects of their help-seeking behavior as they age.

Additionally, questions about responsiveness may be asked: are there truly very few concurrent relations between children's help-seeking behavior and parent responsiveness, and no longitudinal ones? Problem-solving situations may be designed to elicit naturalistic bids and responses from children and parents; aspects of children's bids – including some not assessed in this study (timing, content, use of previous help, etc.) relate to parent responsiveness. Further, after a naturalistic baseline of children's bidding and parents' helping has been established, parents may be instructed to switch to providing a certain level of help, and how children adapt their bids to this shift may be investigated.

Overall, this study is a first step at improving our understanding of how help-seeking in problem-solving contexts emerges within individuals across developmental time. Help-seeking behaviors shifted as children aged, with rate peaking at three years, specificity peaking at five years, and strategy/necessity peaking at 14 months. Aspects of help-seeking (strategy, rate, specificity, number of features) were found to largely be distinct from each other, and not stable within individuals over time; an exception was the average number of features bids contained, which related to specificity at 14 months and necessity at five years. I found little evidence of synchrony between children's help-seeking and parents' responsiveness, either concurrently or longitudinally. I additionally found little evidence that children's help-seeking related to individual differences in other, theoretically-related skills – except, importantly, a relation between vocabulary size and rate of help-seeking. Though this study was limited by a small sample and variability in how families spent their study time, I was able to investigate how children's help-seeking behavior changes over developmental time. Future researchers may

expand my sample size to increase their ability to detect effects that I may have been underpowered to find, as well as investigate relations between parents' responsiveness and children's help-seeking experimentally.

## Chapter 5: General discussion

In the three studies included here, I investigated the emergence of help-seeking behavior, probing developmental change and links to individual differences in cognitive, communicative, and social-cognitive abilities at 14, 18, 38, and 58 months. These studies involved in-lab problem-solving tasks, parent questionnaires, and naturalistic, in-home video recordings, all of which contributed to our growing understanding of the development of help-seeking in young children. Each of these contexts revealed robust evidence of children's help-seeking behavior at all of the ages studied. I found that children at all ages demonstrate sensitivity to problem difficulty, seeking help most often when problems are challenging. I discovered links between children's vocabulary and executive functioning and their help-seeking at 18 months, vocabulary and help-seeking rate at three years, as well as relations between children's prosociality, mastery motivation, and Theory of Mind abilities and help-seeking at five years. Lastly, I examined, in detail, changes in help-seeking behavior that emerge across time, analyzing the nature of a cohort of children's help-seeking bids from 14 months, to 38 months, to 58 months of age.

I primarily focused on two aspects of help-seeking behavior: rate and strategy. Rate refers to children's propensity to seek help, as indexed by the frequency with which they make help-seeking bids. Strategy refers to children's strategic use of help-seeking in response to problem difficulty, including their propensity to restrict help-seeking to situations in which it is most needed and the extent to which the timing and nature of their help-seeking behavior varies for hard versus easy problems. These are two aspects of help-seeking that have most frequently been studied before, and I posited that they might be scaffolded by different skill sets: help-seeking rate might relate to children's prosociality, social-cognitive skills, and communicative abilities, whereas help-seeking strategy might relate to children's executive functioning, social-cognitive skills, and desire to solve problems (mastery motivation).

Across the three studies, I encountered little evidence that these different aspects of help-seeking are interrelated; rather, I found that these aspects are largely distinct and often predicted by different areas of related skills (cognitive, communicative, and social-cognitive). Rate and strategy are two aspects that one might reasonably expect might relate to each other – a child who differentiates little between easy and difficult problems may well seek help more often than do their more strategic peers. However, across all three studies, rate and strategy demonstrated no significant relation. Further, different skills related to these aspects – EF related to strategy at 18 months, and vocabulary related to rate at 18 and 38 months.

Beyond furthering our understanding of these two aspects of help-seeking behavior, I also investigated help-seeking in young children more richly by examining additional aspects, including whether and when they attempt problems on their own before asking for help, as well as developmental changes in help-seeking bids' specificity, form, and the responses they elicit. A review of these findings, along with future directions, follow.

### **Help-seeking rate**

Rate of help-seeking – how often or how likely children are to seek help from others – was of interest to me, particularly because help-seeking has historically been viewed as “overdependence” on others. Instead, I view help-seeking as a critical tool that children regularly use in order to solve everyday problems – a tool that relies on children’s ability and willingness to communicate effectively. How do children utilize this tool from one to five years of age? What individual differences in related skill areas may correlate to differences in help-seeking?

In Study 1, “rate” was defined as how often children sought help across easy and difficult trials. Rate was influenced both by problems’ objective difficulty and by how well individual children did on particular items: rate increased with difficulty and decreased with performance

scores, such that children asked for the most help on problems that they themselves struggled with. Additionally, I investigated whether individual differences in children's cognitive and communicative skills related to differences in help-seeking behavior; I found that rate was positively related to vocabulary. While bids for help were, almost entirely, nonverbal, I nevertheless saw that toddlers with larger productive vocabularies produced more bids for help than did their peers with smaller vocabularies. Perhaps vocabulary is, at this age, also indexing something about how willing and able to communicate toddlers are.

In Study 2, "rate" was generated from a parent-report assessment I designed to investigate five-year-olds' help-seeking. In this assessment, parents were asked to provide a list of activities that their child currently found easy or difficult. Then, they were presented with each activity in turn and asked to rate how likely their child was to ask for help on that activity. Parents reported their children sought help regularly, and significantly more often during challenging activities than during easy ones. In this study, I was interested in how differences in individuals' communicative and social-cognitive abilities relate to how likely they are to seek help. I found that children's prosociality and Theory of Mind abilities negatively related to help-seeking rate, unexpectedly: children who demonstrated more willingness to help others and more skill at taking others' perspectives were less likely to seek help overall. I posited that prosociality and ToM skills were representative of children's more general competency, and that more competent children would need to seek help less (or perhaps are more motivated to complete tasks on their own).

In Study 3, "rate" was defined as how often children sought help across each of their three hour-long, free play, in-home sessions. Children spontaneously made bids for help; every child produced at least one bid, and children produced an average of just over three bids per session. I

found that rate peaked at three years (with an average of five bids per session). While evidence from prior work led to us predict this outcome, our ability to interpret it is limited due to the fact that I did not code for relevant aspects of children's environmental contexts (who is present in the room, the types of activities being engaged in, etc.); it may be that these contexts are what is changing developmentally, rather than children's baseline propensity to seek help. However, three years marks a stage where children's ability to effectively convey what they need help with is increasing, while their desire to accomplish tasks on their own is only just beginning. Other studies have also hinted at this pattern (Bronson, 1974; Geppert & Küster, 1983); it may be that three years is an important age for help-seeking behavior. Additionally, in this study, I found that help-seeking rate related to 38-month-olds' vocabulary, such that those children with larger vocabularies sought help more often than did their peers with smaller vocabularies.

Linking these studies together, I find that help-seeking rate peaks at three years and that individual differences in temperament and communicative and social-cognitive skills relate to rate. Children sought help less frequently at 14 months and 58 months than at 38 months; what factors lead to help-seeking peaking at three years – shifts in skills and desires, environmental contexts, both? Future research may probe this question by assessing help-seeking in a controlled context across multiple age points. I find that rate is positively related to vocabulary size at 18 and 38 months, though not at 58 months. The lack of a relation between vocabulary and rate at 5 years – as assessed both in Study 2 and Study 3 – is intriguing. I posited that all typically-developing children have the vocabulary to effectively seek help within the first few years of life; later help-seeking may be supported by different skills and aspects of personality. Indeed, that is what I find in Study 2 – children's prosociality and Theory of Mind abilities negatively related to children's propensity to seek help. The negative relation between prosociality and



help-seeking rate was surprising: one may posit that help-seeking is not only about achieving an instrumental goal, but also about social goals – interacting and collaborating with others – and therefore our finding that children who were rated as being more helpful to others were less likely to seek out help for themselves overall than their less-prosocial peers. Children whom parents rate as being more prosocial may simply be more competent generally, or perhaps more motivated to solve problems on their own than are their less-prosocial peers – in fact, I did find a positive relation between children’s prosociality and their mastery motivation. Further research that includes a general assessment of competence may probe this question. Moreover, what skills precede and scaffold children’s first help-seeking bids – e.g. receptive vocabulary, gestures, intention understanding, initiating joint attention? Future research may address this question by eliciting help-seeking behavior from infants younger than those assessed in the present studies and relating that behavior to early social and communicative abilities.

While rate was defined somewhat consistently across studies, important differences exist. In the first and third studies, rate was simply defined as the number of bids children produced, but there were critical differences in context – in Study 1, children produced bids in response to a scripted problem-solving task presented in the lab, of a short duration (about 15 minutes). In contrast, rate of help-seeking in Study 3 assessed how often children produced bids in the context of free play in their own homes over an hour of filming time. Placing children in a problem-solving context elicits more help-seeking than free play (De Cooke & Brownell, 1995), and families in Study 3 spent variable amounts of time engaging in activities that involved active problem-solving. Researchers interested in naturalistic help-seeking may consider a combination of these contextual features – perhaps placing parent-child dyads in a home-like setting with toys that require problem-solving to reach or activate (a strategy used with infants in Mosier and

Rogoff, 1994), or by normalizing rate by removing time when families are not engaged in problem-solving.

Differently still, I assessed help-seeking in Study 2 via a parent-report measure I designed to tap children's overall propensity to seek help. Using this measure, I uncovered how individual differences in temperament and social-cognitive skills relate to help-seeking; future research may use this assessment to collect large amounts of data from children of different ages, and relate developmental and individual changes in help-seeking behavior to developments in relevant skill areas.

### **Help-seeking strategy**

In addition to help-seeking rate, I was also interested in examining the development of help-seeking strategy. Humans' ability to limit our reliance on others' help to when it is most necessary is critical to our effective use of help-seeking – without strategy, help-seeking would function as a poor problem-solving tool. Children who do not use help-seeking strategically may find themselves requesting help when it is not needed, perhaps exhausting their social partners (as seen at 58 months, where children asking for help at a high rate had parents who were less responsive to them), or failing to request help when they are truly struggling. How do young children learn to seek help strategically, and what skills might support strategic help-seeking?

In Study 1, “strategy” was defined as how long children waited before bidding for help, with the expectation that children who are more strategic in their help-seeking will observe and attempt problems before deciding to solicit help. This operationalization was chosen over the one used in the following two studies (changes in propensity to help-seek by problem difficulty) because all children dramatically increased their help-seeking between the easy and hard problems – individual differences had little room to emerge in this measure in Study 1. Latency,

however, was more variable. Children waited an average of 10 seconds after each trial was presented before bidding for help; children did not statistically differ in how long they waited to bid for help by whether items were easy or difficult. Marginally, children who sought help during the easy items waited shorter amounts of time before producing their first bid than did children seeking help on the difficult items. I examined whether individual differences in cognitive and communicative skills related to differences in help-seeking strategy; I found that EF related to children's latency to bid for help, such that children with better EF skills waited longer than their lower-EF peers to produce their first bid. Toddlers' EF skills, which may serve as an index of their metacognitive abilities, shapes help-seeking behavior. Children who are less skilled at problem-solving generally were quicker to try soliciting help from others than their higher-EF peers.

In Study 2, I investigated children's strategic use of help-seeking using the same parent-report survey described above. To generate a measure of strategy, the average of how likely children were to ask for help on difficult problems was divided by how likely they were to ask for help on easy problems, generating a ratio score. Higher scores indicated that a child discriminated more between the two types of problems, strategically asking for help more often when problems were, according to their parents, objectively difficult for them. I predicted, based on the findings in Study 1, that children with better EF skills would show a greater differentiation in help-seeking between easy and challenging activities. However, I did not find significant evidence for this. I did find that strategic use of help-seeking related to individual differences in children's prosociality, ToM skills, and mastery motivation. Children whom parents reported took more pleasure in solving problems on their own, were helpful to others,

and skilled at taking others' perspectives were more strategic in their use of help-seeking. As in Studies 1 and 3, help-seeking rate and strategy did not significantly relate to each other.

In Study 3, I defined “strategy” based on a rating coders gave to each bid: How necessary was this bid for help for this child? Strategy was relatively high (a rating of “probably necessary” on average) across all ages, but shifts in children’s strategic use of help-seeking were apparent over time. Fourteen-month-olds, more than any other age group, asked for help specifically when it was most necessary for them, and this trend decreased over time. Perhaps 14-month-olds are still growing accustomed to relying on help-seeking when trying to solve their own problems, and therefore only use it when their needs are greatest. However, multiple dimensions of children’s early lives change with development – their abilities and motivations, the nature of the problems they engage in, the social contexts in which they encounter problems and seek help, etc. Changes over time could reflect any of all of these shifting factors. Future research may study the context in which spontaneous help-seeking bids occur in much greater detail to assess which of the factors that change with development most strongly relate to help-seeking strategy.

Strategic use of help-seeking was apparent across the three studies, with children of all ages consistently asking for more help when problems were objectively difficult than when they were easy. Further, help-seeking strategy, like rate, related to different aspects of children’s abilities and personalities at different ages. Children’s strategic use of help-seeking was related to their executive functioning at 18 months, and to children’s prosociality, Theory of Mind skills, and mastery motivation at 5 years. The relation between EF and strategy only emerged at 18 months – it is possible that executive functioning is more important for supporting help-seeking early in childhood, when children are first learning how to work through the multiple steps of the problem-solving process. Alternately, it may be that the relation between EF and strategic use of

help-seeking is specific to how I defined strategy in Study 1 – as latency to bid for help. Future research may continue to evaluate how EF relates to help-seeking strategy across ages, as well as investigate whether latency to seek help continues to relate to EF as children age.

In Study 3, I found that children who were more prosocial, better at taking others' perspectives, and more motivated to solve problems were more strategic in their help-seeking behavior by five years of age. While I did not replicate the finding that ToM and strategy relate at five years in Study 3, this may be due to the small sample size. Future research may probe the relation between strategy and social cognition by evaluating how these two factors relate as children age beyond five years – it may even be that adults who are more skilled at understanding others' goals, knowledge, and abilities are better at adapting their help-seeking based on the difficulty of the problem before them.

Strategy, as outlined above, was operationalized as latency to bid for help in Study 1, the ratio between children's propensity to bid for help during challenging vs. easy activities in Study 2, and by how necessary bids were in Study 3. These variable methods of assessing strategic use of help-seeking demonstrates how even this single aspect of help-seeking behavior is multifaceted, but also limited my ability to look for and replicate findings across studies. Children's latency to bid for help related to EF at 18 months, but I did not evaluate this measure in Study 2 or Study 3. It may be that children's ability to self-regulate and plan problem-solving steps continues to relate to how long children wait to seek help once they encounter a problem as they age. Future research may address this question by assessing latency at multiple age points, as stated previously, and also investigate how other aspects of help-seeking strategy, such as how necessary bids were, relate to latency.

In Studies 2 and 3, problems' difficulty was assigned by parents (Study 2) or by coders (Study 3). In Study 2, I found that children's Theory of Mind skills related to their help-seeking strategy only when parents rated how difficult problems were. In Study 3, each problem's difficulty was gauged by coders, whose reliability on this measure was good, but not excellent. While the limited sample size in Study 3 should not be ignored, it might also be that parents are better at identifying which problems are truly challenging for their children. Perhaps asking parents to watch videos of their children and rate how much they were struggling would provide a more accurate measure of the necessity of children's bids, and provide a stronger basis for evaluating potential relations between ToM and help-seeking strategy.

#### **Other aspects of help-seeking: attempting, specificity, and form**

In Studies 1 and 3, I was able to investigate additional aspects of help-seeking behavior beyond rate and strategy. While Study 2 was conducted virtually and primarily via parent report, which limited our ability to probe help-seeking behaviors in detail, Studies 1 and 3 were designed such that I could examine multiple components of help-seeking. In Study 1, 18-month-olds were presented, in-lab, with a problem-solving task which increased in difficulty. In Study 3, children across three age points (14, 38, and 58 months) spontaneously produced help-seeking bids as experimenters filmed them playing freely in their homes.

The majority of bids in Study 1 included (primarily nonverbal) vocalizations, gaze switches between the problem and a potential helper, and gestures; in this lab setting, toddlers directed the vast majority of their bids to the experimenter. Children strategically employed more communicative strategies (gaze, gesture, vocalizations) on difficult versus easy items – the more necessary a bid, the more varied the strategies that children used in an attempt to solicit help. Use

of communicative strategies is another avenue by which to explore children's strategic use of help-seeking.

In Study 1, I coded, in addition to how often and when children sought help across easy and difficult items of the problem-solving task, whether they attempted the problem before seeking help and the forms those help-seeking bids took. I found that those children who chose to seek help during the easy items were significantly less likely to attempt to solve the problem before seeking help than those who chose to seek help during the difficult items (most participants). Additionally, children with larger vocabularies were marginally less likely to attempt problems before asking for help. Children who sought help during the easy items – a small minority of the participants – and children with larger vocabularies attempted to solve problems on their own before bidding for help less often than their peers.

In Study 3, in addition to coding how often children sought help across the session and how strategic or necessary those bids were, each bid's specificity in context as well as its form were coded. Help-seeking bids most often contained vocalizations, along with some gaze switching and clarifying gestures; in this in-home setting, children directed their bids to their parents most of the time.

The number of features contained in children's bids related significantly to help-seeking strategy at five years; children who tended to ask for help when it was most necessary or strategic also used more features in their bids, a finding that echoes a finding from Study 1 – that children used more bid features during difficult problems than during easy ones. The number of features bids included also related to an aspect of help-seeking at 14 months: specificity. At this age, children increase the specificity of their bids by adding communicative features; when young children are trying to elicit help from a certain social partner on a certain problem, they

clarify their goals by adding gesture and gaze (a relation not seen at other ages). In future work, I may continue to investigate how children use multiple communicative features in their bids to convey necessity and add specificity, and how these communicative processes may change with development. It may be that adults, like five-year-olds, add communicative features to their bids for help with their need is greatest or most urgent, and children prior to 14 months may rely more on multiple communicative features than older children in order to effectively elicit help.

In Study 3, bids were quite specific overall. Coders rated each bid's specificity on a scale of 1 to 4, with a rating of 1 indicating a bid that neither identified the problem nor elicited help from a specific social partner. A score of 4 indicated that the child both specifically identified a problem and solicited help from a specific person. Bids in this study had an average rating of 3 (helper clearly identified but nature of the problem is more vague, or vice versa). As predicted, children's specificity increased with age. As children's ability to communicate clearly and efficiently improved with age, so did the specificity of their bids.

### **Responses to help-seeking**

In Study 3, I was able to explore whether and how parents' responses relate to children's help-seeking, both in rate and strategy. Parents were somewhat responsive to their children in this study. Coders rated how parents responded to each bid on a scale of 1 to 4, with a rating of 1 indicating that parents ignored, said no to, or otherwise sidestepped a bid, and a rating of 4 indicating that parents were already moving to help before the bid was even complete. In this study, average responsiveness landed between the ratings of 2 ("told child to try again on their own") and 3 ("provided help after the bid was complete") – parents readily both encouraged children to attempt problems independently and provided requested help. This average did not significantly change with age. While both children's specificity and necessity of their bids



changed over time, parents remained relatively constant in how responsive they were. It is possible that parent responsiveness is independent of children's age, and purely reliant on situational factors (difficulty of the problem, what parents want children to be doing, parents' mood, etc.). Alternatively, it may be that I was unable to detect age-based changes in responsiveness due to the variable activities and social contexts that were apparent between ages, even within families.

One aspect of child behavior that did influence parents' responsiveness was rate of help-seeking: at five years, children who sought help frequently had parents who were less responsive to their bids. Effective help-seeking, as noted earlier, relies on not under- or over-utilizing social partners; asking for help too often may lead potential helpers to begin ignoring bids. Another interpretation of this finding is that children with less-responsive parents have, by five years, adapted to this level of responsiveness by producing more bids. Do children adapt to their parents' responsiveness when solving problems? Future research may address this question by experimentally manipulating parents' responsiveness, or introducing children to researchers who provide varying levels of responsiveness when asked for help. Parents may also be shown videos of children struggling with problems to varying degrees and asked to rate if and how they would provide help; responses could be related to parents' actual responsiveness to their own children.

## **Conclusion**

Overall, I find that help-seeking is a complex, multi-faceted behavior readily displayed by children as young as 14 months old. Across multiple forms of assessment (in-lab task, parent report, naturalistic free play), children spontaneously produced strategic bids for help. Aspects of help-seeking behavior (rate, specificity, necessity) changed with developmental time.

The findings from these three studies progress our current understanding of children's help-seeking behavior. Future research, with larger sample sizes, context coding, and additional individual differences measures may elaborate on these findings and further elucidate the nature of young human's help-seeking as a problem-solving tool.

## REFERENCES

- Barcenilla, C. C., Luttges, B. L., Rojas-Barahona, C. A., & Campos, A. L. (2021). Psychometric analysis of the Children's Behavior Questionnaire (CBQ) in Chile. *Current Psychology*. <https://doi.org/10.1007/s12144-021-01871-9>
- Bates, D., Mächler, M., Bolker, B. M., & Walker, S. C. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software*, 67(1). <https://doi.org/10.18637/jss.v067.i01>
- Bates, E., Carlson-Luden, V., & Bretherton, I. (1980). Perceptual aspects of tool using in infancy. *Infant Behavior and Development*, 3, 127–140. [https://doi.org/10.1016/S0163-6383\(80\)80017-8](https://doi.org/10.1016/S0163-6383(80)80017-8)
- Benenson, J. F., & Koulkazarian, M. (2008). Sex differences in help-seeking appear in early childhood. *British Journal of Developmental Psychology*, 26(2), 163–169. <https://doi.org/10.1348/026151007X231048>
- Brandone, A. C., & Wellman, H. M. (2009). You can't always get what you want: Infants understand failed goal-directed actions. *Psychological Science*, 20(1), 85–91. <https://doi.org/10.1111/j.1467-9280.2008.02246.x>
- Brezack, N., Radovanovic, M., & Woodward, A. L. (2021). Everyday interactions support toddlers' learning of conventional actions on artifacts. *Journal of Experimental Child Psychology*, 210, 105201. <https://doi.org/10.1016/j.jecp.2021.105201>
- Bronson, W. C. (1974). Mother-toddler interaction: A perspective on studying the development of competence. *Merrill-Palmer Quarterly of Behavior and Development*, 23(1), 275–301.
- Brownell, C. A. (2016). Prosocial Behavior in Infancy: The Role of Socialization. *Child Development Perspectives*, 10(4), 222–227. <https://doi.org/10.1111/cdep.12189>
- Burke, N. (2021). *The cognitive value of social relationships: an argument for Social Network Theory in developmental science* (Issue June).
- Calarco, J. M. C. (2011). "I Need Help!" Social Class and Children's Help-Seeking in Elementary School. *American Sociological Review*, 76(6), 862–882. <https://doi.org/10.1177/0003122411427177>
- Cameron Ponitz, C. E., McClelland, M. M., Jewkes, A. M., Connor, C. M. D., Farris, C. L., & Morrison, F. J. (2008). Touch your toes! Developing a direct measure of behavioral regulation in early childhood. *Early Childhood Research Quarterly*, 23(2), 141–158. <https://doi.org/10.1016/j.ecresq.2007.01.004>
- Carlson, S. M., & Moses, L. J. (2001). Individual Differences in Inhibitory Control and Children's Theory of Mind. *Child Development*, 72(4), 1032–1053. <https://doi.org/10.1111/1467-8624.00333>

- Carlson, S. M., Moses, L. J., & Claxton, L. J. (2004). Individual differences in executive functioning and theory of mind: An investigation of inhibitory control and planning ability. *Journal of Experimental Child Psychology*, 87(4), 299–319. <https://doi.org/10.1016/j.jecp.2004.01.002>
- Cartmil, E. A., Hunsicker, D., & Goldin-Meadow, S. (2014). Pointing and naming are not redundant: Children use gesture to modify nouns before they modify nouns in speech. *Developmental Psychology*, 50(6), 1660–1666. <https://doi.org/10.1037/a0036003>
- Chen, C., & Stevenson, H. W. (1988). Cross-linguistic differences in digit span of preschool children. *Journal of Experimental Child Psychology*, 46(1), 150–158. [https://doi.org/10.1016/0022-0965\(88\)90027-6](https://doi.org/10.1016/0022-0965(88)90027-6)
- Collisson, B. A., Graham, S. A., Preston, J. L., Rose, M. S., McDonald, S., & Tough, S. (2016). Risk and protective factors for late talking: An epidemiologic investigation. *Journal of Pediatrics*. <https://doi.org/10.1016/j.jpeds.2016.02.020>
- Crais, E., Douglas, D. D., & Campbell, C. C. (2004). The Intersection of the Development of Gestures and Intentionality. *Journal of Speech Language and Hearing Research*, 47(3), 678. [https://doi.org/10.1044/1092-4388\(2004\)052](https://doi.org/10.1044/1092-4388(2004)052)
- De Cooke, P. A., & Brownell, C. A. (1995). Young Children's Help-Seeking in Mastery-Oriented Contexts. In *Source: Merrill-Palmer Quarterly* (Vol. 41, Issue 2).
- De Pauw, S. S. W., Mervielde, I., & Van Leeuwen, K. G. (2009). How are traits related to problem behavior in Preschoolers? Similarities and contrasts between temperament and personality. *Journal of Abnormal Child Psychology*, 37(3), 309–325. <https://doi.org/10.1007/s10802-008-9290-0>
- Diamond, A. (2016). Executive functions. *Annual Review of Psychology*, 93–103. [https://doi.org/10.1007/978-3-319-42662-4\\_9](https://doi.org/10.1007/978-3-319-42662-4_9)
- Falck-Ytter, T., Gredebäck, G., & Von Hofsten, C. (2006). Infants predict other people's action goals. *Nature Neuroscience*, 9(7), 878–879. <https://doi.org/10.1038/nn1729>
- Farrar, M. J., & Maag, L. (2002). Early language development and the emergence of a theory of mind. *First Language*, 22(2), 197–213. <https://doi.org/10.1177/014272370202206504>
- Fenson, L., Dale, P. S., Reznick, J. S., Bates, E., Thal, D. J., Pethick, S. J., Tomasello, M., Mervis, C. B., & Stiles, J. (1994). Variability in Early Communicative Development. *Monographs of the Society for Research in Child Development*, 59(5), i. <https://doi.org/10.2307/1166093>
- Fenson, L., Pethick, S., Renda, C., Cox, J. L., Dale, P. S., & Reznick, J. S. (2000). Short-form versions of the MacArthur communicative development inventories. *Applied Psycholinguistics*, 21(1), 95–115. <https://doi.org/10.1017/s0142716400001053>

- Fernandez-Duque, D., Baird, J. A., & Posner, M. I. (2000). Executive Attention and Metacognitive Regulation. *Consciousness and Cognition*, 9(2), 288–307. <https://doi.org/10.1006/ccog.2000.0447>
- Frausel, R., Oswald, M., Mansfield, E., Goldin-Meadow, S., & Levine, S. (2020). *An Observational Study of the Nature and Frequency of Parent-Child Activities in the Home*.
- Gartstein, M. A., Putnam, S. P., & Rothbart, M. K. (2012). Etiology of preschool behavior problems: Contributions of temperament attributes in early childhood. *Infant Mental Health Journal*, 33(2), 197–211. <https://doi.org/10.1002/imhj.21312>
- Geppert, U., & Küster, U. (1983). The Emergence of “Wanting to Do It Oneself”: A Precursor of Achievement Motivation. *International Journal of Behavioral Development*, 6(3), 355–369. <https://doi.org/10.1177/016502548300600305>
- Gerstadt, C. L., Joo Hong, Y., & Diamond, A. (1994). The relationship between cognition and action: performance of children 3.5-7 years old on a Stroop-like day-night test. In *Cognition* (Vol. 53, pp. 129–153).
- Giner Torr ens, M., & K artner, J. (2019). Affiliation motivates children’s prosocial behaviors: Relating helping and comforting to imitation. *Social Development*, 28(3), 501–513. <https://doi.org/10.1111/sode.12357>
- Goodman, A., & Goodman, R. (2009). Strengths and difficulties questionnaire as a dimensional measure of child mental health. *Journal of the American Academy of Child and Adolescent Psychiatry*, 48(4), 400–403. <https://doi.org/10.1097/CHI.0b013e3181985068>
- Goodman, R. (1997a). The strengths and difficulties questionnaire: A research note. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 38(5), 581–586. <https://doi.org/10.1111/j.1469-7610.1997.tb01545.x>
- Goodman, R. (1997b). The strengths and difficulties questionnaire: A research note. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 38(5), 581–586. <https://doi.org/10.1111/j.1469-7610.1997.tb01545.x>
- Gottwald, J. M., Achermann, S., Marciszko, C., Lindskog, M., & Gredeb ack, G. (2016). An Embodied Account of Early Executive-Function Development. *Psychological Science*, 27(12), 1600–1610. <https://doi.org/10.1177/0956797616667447>
- Goubet, N., Rochat, P., Maire-Leblond, C., & Poss, S. (2006). Learning from others in 9-18-month-old infants. *Infant and Child Development*, 15(2), 161–177. <https://doi.org/10.1002/icd.446>
- Goupil, L., Romand-Monnier, M., & Kouider, S. (2016). Infants ask for help when they know they don’t know. *Proceedings of the National Academy of Sciences*, 113(13), 3492–3496. <https://doi.org/10.1073/pnas.1515129113>

- Hammond, S. I., Müller, U., Carpendale, J. I. M., Bibok, M. B., & Liebermann-Finestone, D. P. (2012). The effects of parental scaffolding on preschoolers' executive function. *Developmental Psychology, 48*(1), 271–281. <https://doi.org/10.1037/a0025519>
- Hayden, E. P., Durbin, C. E., Klein, D. N., & Olino, T. M. (2010). Maternal personality influences the relationship between maternal reports and laboratory measures of child temperament. *Journal of Personality Assessment, 92*(6), 586–593. <https://doi.org/10.1080/00223891.2010.513308>
- Honig, A. S., & Wittmer, D. S. (1985). Toddler bids and teacher responses. *Child Care Quarterly, 14*(1), 14–29. <https://doi.org/10.1007/BF01113506>
- House, B. R. (2018). How do social norms influence prosocial development? In *Current Opinion in Psychology* (Vol. 20, pp. 87–91). Elsevier B.V. <https://doi.org/10.1016/j.copsyc.2017.08.011>
- Kärtner, J., Keller, H., & Chaudhary, N. (2010). Cognitive and Social Influences on Early Prosocial Behavior in Two Sociocultural Contexts. *Developmental Psychology, 46*(4), 905–914. <https://doi.org/10.1037/a0019718>
- Kärtner, J., Schuhmacher, N., & Collard, J. (2014). Socio-cognitive influences on the domain-specificity of prosocial behavior in the second year. *Infant Behavior and Development, 37*(4), 665–675. <https://doi.org/10.1016/j.infbeh.2014.08.004>
- Keen, R. (2011). The Development of Problem Solving in Young Children: A Critical Cognitive Skill. *Annual Review of Psychology, 62*(1), 1–21. <https://doi.org/10.1146/annurev.psych.031809.130730>
- Klein-Tasman, B. P., & Mervis, C. B. (2003). Distinctive personality characteristics of 8-, 9-, and 10-year-olds with Williams syndrome. *Developmental Neuropsychology, 23*(1–2), 269–290. [https://doi.org/10.1207/s15326942dn231&2\\_12](https://doi.org/10.1207/s15326942dn231&2_12)
- Köster, M., Cavalcante, L., Vera Cruz de Carvalho, R., Dôgo Resende, B., & Kärtner, J. (2016). Cultural Influences on Toddlers' Prosocial Behavior: How Maternal Task Assignment Relates to Helping Others. *Child Development, 87*(6), 1727–1738. <https://doi.org/10.1111/cdev.12636>
- Kyza, E. A., Georgiou, Y., Hadjichambi, D., & Hadjichambis, A. (2013). Teacher framing, classroom collaboration scripts, and help-seeking and help-giving behaviors. *Computer-Supported Collaborative Learning Conference, CSCL, 1*(2011), 272–279.
- LaBounty, J., Bosse, L., Savicki, S., King, J., & Eisenstat, S. (2017). Relationship between Social Cognition and Temperament in Preschool-aged Children. *Infant and Child Development, 26*(2), 1–10. <https://doi.org/10.1002/icd.1981>

- Leonard, J. A., & Schulz, L. E. (2010). *If at First You Don ' t Succeed : The Role of Evidence in Preschoolers ' and Infants '* . 1290–1295.
- Libertus, M. E., Odic, D., Feigenson, L., & Halberda, J. (2015). A Developmental Vocabulary Assessment for Parents (DVAP): Validating Parental Report of Vocabulary Size in 2- to 7-Year-Old Children. *Journal of Cognition and Development*, *16*(3), 442–454. <https://doi.org/10.1080/15248372.2013.835312>
- Marulis, L. M., & Nelson, L. J. (2021). Metacognitive processes and associations to executive function and motivation during a problem-solving task in 3–5 year olds. *Metacognition and Learning*, *16*(1), 207–231. <https://doi.org/10.1007/s11409-020-09244-6>
- McCarty, M. E., Clifton, R. K., & Collard, R. R. (1999). Problem solving in infancy: the emergence of an action plan. *Developmental Psychology*. <https://doi.org/10.1037/0012-1649.35.4.1091>
- McClelland, M. M., Cameron, C. E., Duncan, R., Bowles, R. P., Acock, A. C., Miao, A., & Pratt, M. E. (2014). Predictors of early growth in academic achievement: The head-toes-knees-shoulders task. *Frontiers in Psychology*, *5*(JUN), 1–14. <https://doi.org/10.3389/fpsyg.2014.00599>
- Meltzoff, A. N. (1995). Understanding the intentions of others: Re-enactment of intended acts by 18-month-old children. *Developmental Psychology*, *31*(5), 838–850. <https://doi.org/10.1037/0012-1649.31.5.838>
- Milligan, K., Astington, J. W., & Dack, L. A. (2007). Language and theory of mind: Meta-analysis of the relation between language ability and false-belief understanding. *Child Development*, *78*(2), 622–646. <https://doi.org/10.1111/j.1467-8624.2007.01018.x>
- Mondell, S., & Tyler, F. B. (1981). Parental competence and styles of problem solving/play behavior with children. *Developmental Psychology*, *17*(1), 73–78. <https://doi.org/10.1037/0012-1649.17.1.73>
- Morgan, G. A., Liao, H.-F., & Józsa, K. (2020). *Assessing Mastery Motivation in Children Using the Dimensions of Mastery Questionnaire (DMQ)* (Issue December).
- Mosier, C. E., & Rogoff, B. (1994a). Infants' Instrumental Use of Their Mothers to Achieve Their Goals. *Child Development*, *65*(1), 70–79. <https://doi.org/10.1111/j.1467-8624.1994.tb00735.x>
- Mosier, C. E., & Rogoff, B. (1994b). Infants' Instrumental Use of Their Mothers to Achieve Their Goals. *Child Development*, *65*(1), 70–79. <https://doi.org/10.1111/j.1467-8624.1994.tb00735.x>
- Mundy, P., Delgado, C., Block, J., Venezia, M., Hogan, A., & Seibert, J. (2003). *EARLY SOCIAL COMMUNICATION SCALES ( ESCS )*.

- Neitzel, C., & Stright, A. D. (2003). Mothers' scaffolding of children's problem solving: Establishing a foundation of academic self-regulatory competence. *Journal of Family Psychology, 17*(1), 147–159. <https://doi.org/10.1037/0893-3200.17.1.147>
- Nelson-Le Gall, S. (1981). Help-seeking: An understudied problem-solving skill in children. *Developmental Review, 1*(3), 224–246. [https://doi.org/10.1016/0273-2297\(81\)90019-8](https://doi.org/10.1016/0273-2297(81)90019-8)
- Nelson-Le Gall, S. (1987). Necessary and Unnecessary Help-Seeking in Children. *The Journal of Genetic Psychology, 148*(1), 53–62. <https://doi.org/10.1080/00221325.1987.9914536>
- Nelson-Le Gall, S., & Glor-Scheib, S. (1986). Academic help-seeking and peer relations in school. *Contemporary Educational Psychology, 11*(2), 187–193. [https://doi.org/10.1016/0361-476X\(86\)90008-1](https://doi.org/10.1016/0361-476X(86)90008-1)
- Nelson-Le Gall, S., & Jones, E. (1990). Cognitive-Motivational Influences on the Task-Related Help-Seeking Behavior of Black Children. *Child Development, 61*(2), 581–589.
- Newman, R. S. (1990a). Children's Help-Seeking in the Classroom: The Role of Motivational Factors and Attitudes. *Journal of Educational Psychology, 82*(1), 71–80. <https://doi.org/10.1037/0022-0663.82.1.71>
- Newman, R. S. (1990b). Children's Help-Seeking in the Classroom: The Role of Motivational Factors and Attitudes. *Journal of Educational Psychology, 82*(1), 71–80. <https://doi.org/10.1037/0022-0663.82.1.71>
- Newman, R. S. (2000). Social Influences on the Development of Children's Adaptive Help Seeking: The Role of Parents, Teachers, and Peers. *Developmental Review, 20*(3), 350–404. <https://doi.org/10.1006/drev.1999.0502>
- Newman, R. S., & Schwager, M. T. (1993). Students' Perceptions of the Teacher and Classmates in Relation to Reported Help Seeking in Math Class. *The Elementary School Journal, 94*(1), 3–17. <https://doi.org/10.1086/461747>
- Newman, R. S., & Schwager, M. T. (1998). Students' Help Seeking during Problem Solving: Influences of Personal and Contextual Achievement Goals. *Journal of Educational Psychology, 90*(4), 644–658. <https://doi.org/10.1037/0022-0663.90.4.644>
- Newton, E. K., Goodman, M., & Thompson, R. A. (2014). Why Do Some Toddlers Help A Stranger? Origins of Individual Differences in Prosocial Behavior. *Infancy, 19*(2), 214–226. <https://doi.org/10.1111/infa.12043>
- Nilsen, E. S., Huyder, V., McAuley, T., & Liebermann, D. (2017). Ratings of Everyday Executive Functioning (REEF): A parent-report measure of preschoolers' executive functioning skills. *Psychological Assessment, 29*(1), 50–64. <https://doi.org/10.1037/pas0000308>



- Olino, T. M., Durbin, C. E., Klein, D. N., Hayden, E. P., & Dyson, M. W. (2013). Gender Differences in Young Children's Temperament Traits: Comparisons Across Observational and Parent-Report Methods. *Journal of Personality*, *81*(2), 119–129. <https://doi.org/10.1111/jopy.12000>
- Putnam, S. P., & Rothbart, M. K. (2006). Development of short and very short forms of the Children's Behavior Questionnaire. *Journal of Personality Assessment*, *87*(1), 102–112. [https://doi.org/10.1207/s15327752jpa8701\\_09](https://doi.org/10.1207/s15327752jpa8701_09)
- Puustinen, M. (1998). Help-seeking behavior in a problem-solving situation: Development of self-regulation. In *European Journal of Psychology of Education: Vol. XIII*.
- Puustinen, M., Kokkonen, M., Tolvanen, A., & Pulkkinen, L. (2004). Children's help seeking and impulsivity. *Learning and Individual Differences*, *14*(4), 231–246. <https://doi.org/10.1016/j.lindif.2004.04.001>
- Puustinen, M., Lyyra, A. L., Metsäpelto, R. L., & Pulkkinen, L. (2008). Children's help seeking: The role of parenting. *Learning and Instruction*, *18*(2), 160–171. <https://doi.org/10.1016/j.learninstruc.2007.02.001>
- Ramenzoni, V. C., & Liskowski, U. (2016). The Social Reach: 8-Month-Olds Reach for Unobtainable Objects in the Presence of Another Person. *Psychological Science*, *27*(9), 1278–1285. <https://doi.org/10.1177/0956797616659938>
- Roebbers, C. M. (2017). Executive function and metacognition: Towards a unifying framework of cognitive self-regulation. In *Developmental Review* (Vol. 45, pp. 31–51). Mosby Inc. <https://doi.org/10.1016/j.dr.2017.04.001>
- Rothbart, M. K. (1981). Measurement of Temperament in Infancy. *Source: Child Development*, *52*(2), 569–578.
- Rudasill, K. M., Prokasky, A., Tu, X., Frohn, S., Sirota, K., & Molfese, V. J. (2014). Parent vs. teacher ratings of children's shyness as predictors of language and attention skills. *Learning and Individual Differences*, *34*, 57–62. <https://doi.org/10.1016/j.lindif.2014.05.008>
- Ryan, A. M., Gheen, M. H., & Midgley, C. (1998). Why Do Some Students Avoid Asking for Help? An Examination of the Interplay among Students' Academic Efficacy, Teachers' Social-Emotional Role, and the Classroom Goal Structure. *Journal of Educational Psychology*, *90*(3), 528–535. <https://doi.org/10.1037/0022-0663.90.3.528>
- Shimamura, A. P. (2000). Toward a Cognitive Neuroscience of Metacognition. *Consciousness and Cognition*, *9*(2), 313–323. <https://doi.org/10.1006/ccog.2000.0450>
- Snyder, C. M. (2007). *The effect of task difficulty on preschoolers' problem-solving and emotion-regulation strategy use*. 1–48.

- Sommerville, J. A., Enright, E. A., Horton, R. O., Lucca, K., Sitch, M. J., & Kirchner-Adelhart, S. (2018). Infants' prosocial behavior is governed by cost-benefit analyses. *Cognition*, *177*, 12–20. <https://doi.org/10.1016/j.cognition.2018.03.021>
- Stout, W., Karahuta, E., Laible, D., & Brandone, A. C. (2020). A longitudinal study of the differential social-cognitive foundations of early prosocial behaviors. *Infancy*, *November*, 1–20. <https://doi.org/10.1111/infa.12381>
- Tahiroglu, D., Moses, L. J., Carlson, S. M., Mahy, C. E. V., Olofson, E. L., & Sabbagh, M. A. (2014). The children's social understanding scale: Construction and validation of a parent-report measure for assessing individual differences in children's theories of mind. *Developmental Psychology*, *50*(11), 2485–2497. <https://doi.org/10.1037/a0037914>
- Thompson, R. B., Arsenault, S., & Williams, D. (2006). The effects of preschool girls' and boys' help seeking on adult evaluations of dyadic problem solving. *Journal of Language and Social Psychology*, *25*(2), 146–166. <https://doi.org/10.1177/0261927X06286381>
- Thompson, R. B., Cothran, T., & McCall, D. (2012). Gender and age effects interact in preschoolers' help-seeking: Evidence for differential responses to changes in task difficulty. *Journal of Child Language*, *39*(5), 1107–1120. <https://doi.org/10.1017/S030500091100047X>
- Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences*, *28*(5), 675–691. <https://doi.org/10.1017/S0140525X05000129>
- Traverso, L., Viterbori, P., & Usai, M. C. (2020). Prosocial Behavior: The Role of Theory of Mind and Executive Functions. *Journal of Cognition and Development*, *21*(5), 690–708. <https://doi.org/10.1080/15248372.2020.1828425>
- Warneken, F., & Tomasello, M. (2006). Helping in Human Infants and Young Chimpanzees. *Science*, *311*(5765), 1301–1303. <https://doi.org/10.1126/science.1121448>
- Warneken, F., & Tomasello, M. (2007). Helping and cooperation at 14 months of age. *Infancy*, *11*(3), 271–294. <https://doi.org/10.1111/j.1532-7078.2007.tb00227.x>
- Wellman, H. M., Lane, J. D., Labounty, J., & Olson, S. L. (2011). Observant, nonaggressive temperament predicts theory-of-mind development. *Developmental Science*, *14*(2), 319–326. <https://doi.org/10.1111/j.1467-7687.2010.00977.x>
- Wellman, H. M., & Liu, D. (2004). Scaling of theory-of-mind tasks. In *Child Development* (Vol. 75, Issue 2, pp. 523–541). <https://doi.org/10.1111/j.1467-8624.2004.00691.x>
- Woodward, A. L. (1998). Infants selectively encode the goal object of an actor's reach. *Cognition*, *69*(1), 1–34. [https://doi.org/10.1016/S0010-0277\(98\)00058-4](https://doi.org/10.1016/S0010-0277(98)00058-4)

Zelazo, P. D., Carter, A., Reznick, J. S., & Frye, D. (1997). Early development of executive function: A problem-solving framework. *Review of General Psychology, 1*(2), 198–226.  
<https://doi.org/10.1037/1089-2680.1.2.198>