

The Development of Prosocial Behaviors between Siblings: Instrumental Helping, Sharing,  
Comforting, and Protecting

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## ABSTRACT

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The aim of this study was to investigate the development of prosocial behaviors between siblings in a naturalistic setting over a period of two years. This study examined (1) behavioral cues indicating siblings' needs, (2) responses to siblings' manifestations of need, and (3) engagement or failure to engage in prosocial behaviors. A total of 40 families with two children were observed in their homes at two time points; when they were 2- and 4-years and then 4- and 6-years of age. Siblings' interactions were coded for 180 minutes at each time point. Overall, children often failed to express their needs explicitly and consequently, parents intervened frequently to clarify children's ambiguous manifestations of need, although the children's helping behavior did not depend on parental intervention. Children's expressions of need changed over time and varied between siblings. Moreover, some behavioral cues such as nonverbal request and negative emotionality appeared to be more persuasive to siblings, as they elicited prosociality more than other cues. As children got older, they more often addressed implicit cues. Children engaged in helping and sharing more than comforting and protecting, and the theorized association between types of behavioral cues and children's engagement in different forms of prosocial behavior was found. Children's engagement in sharing was found to depend on its cost, as well as the ownership status of the contested resource. Overall, the findings illuminate how prosociality develops between siblings. Implications for parents and educators are discussed in terms of possible ways in which this development might be facilitated.

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## Table of Contents

List of Figures .....	viii
List of Tables .....	ix
List of Appendices .....	x
Introduction.....	1
Categorizing Prosocial Behavior .....	1
Different Perspectives on Early Emergence of Prosocial Behavior .....	4
Early Development of Prosocial Behavior Types.....	6
Instrumental helping .....	6
Behavioral cues indicating instrumental need .....	6
Sharing .....	7
Behavioral cues indicating inadequate distribution of resources.....	9
Comforting.....	10
Behavioral cues indicating negative emotionality .....	10
Prosocial Behavior Between Siblings.....	11
The Current Study.....	14
Elaboration of Hypotheses .....	15
Behavioral cues indicating siblings' needs.....	15
Different responses to siblings' manifestations of need .....	16
Prosocial behaviors types.....	17
Method .....	20
Participants.....	20
Procedure .....	20
Coding.....	21
Behavioral cues.....	22
Responses.....	22
Prosocial behaviors .....	23
Instrumental helping .....	23
Sharing .....	23
Comforting.....	24
Protecting .....	24

Interrater Reliability.....	25
Results.....	29
Plan of Analysis .....	29
Behavioral Cues Indicating Siblings’ Needs .....	29
Overall frequencies.....	29
Proportional scores.....	31
Birth order effects .....	33
Different Responses to Siblings’ Manifestations of Need.....	33
Overall frequencies.....	33
Proportional scores.....	34
Birth order effects .....	35
Variations in Responses to Different Behavioral Cues of Need.....	35
Addressing .....	36
Rejection .....	36
Not responding.....	36
Not responding due to parental intervention.....	36
Prosocial Behaviors Types.....	38
Addressing .....	40
Rejection .....	40
Addressing relative to rejecting prosociality types.....	40
Birth order effects for addressing prosocial behavior types .....	41
Birth order effects for rejecting prosocial behavior types .....	42
Siblings’ Prosocial Behaviors in the Presence of Different Types of Behavioral Cues .....	42
Subtypes of Different Forms of Prosocial Behavior.....	45
Instrumental helping .....	45
Sharing .....	45
Costly and non-costly sharing.....	45
Ownership vs. possession sharing.....	46
Comforting.....	46
Protecting .....	46
Addressing relative to rejecting subtypes of prosociality .....	46

Addressing relative to rejecting instrumental helping by doing an action and by providing information.....	47
Addressing relative to rejecting costly and noncostly sharing.....	47
Addressing relative to rejecting ownership vs. possession sharing .....	49
Discussion .....	49
Behavioral Cues Indicating Siblings’ Needs .....	50
Responses to the Manifestation of Need.....	52
Variation in responses based on behavioral cues.....	54
Engaging in or Failure to Engage in Prosocial Behaviors .....	56
Variation in engaging in prosocial behaviors based on behavioral cues .....	58
Frequencies of engaging in prosocial behavior subtypes .....	60
Summary of Key Findings .....	62
Implications and Conclusions .....	67
Future Directions .....	69
References .....	72
Appendices.....	77

## **List of Figures**

Figure 1. Coding Process .....	26
Figure 2. Frequency of Responses to the Expression of Need at Time 1 and Time 2 .....	34
Figure 3. Patterns of Addressing and Rejection Responses to Different Prosociality Types .....	41

## List of Tables

Table 1. Coding Example for Two Sequence .....	27
Table 2. Cohen’s Kappas for Interrater Reliabilities .....	28
Table 3. Means and Standard Errors of Behavioral Cues Indicating Need .....	30
Table 4. Means and Standard Errors of Older and Younger Siblings’ Types of Behavioral Cues .....	32
Table 5. Means and Standard Errors of Children’s Responses in the Presence of Different Types of Behavioral Cues.....	37
Table 6. Means and Standard Errors of each Sibling’s Responses in the Presence of Different Types of Behavioral Cues.....	39
Table 7. Means and Standard Errors of Siblings’ Prosocial Behaviors in the Presence of Different Types of Behavioral Cues.....	44
Table 8. Means and Standard Errors of Addressing Subtypes of Prosocial Behavior.....	48

**List of Appendices**

Appendix A. Topography of Family Behavior ..... 77  
Appendix B. Excerpts of Transcripts Including each Prosocial Behavior Subtype ..... 78  
Appendix C. Cues that May or May not Elicit Prosociality ..... 82  
Appendix D. Responses to Cues ..... 84  
Appendix E. Types of Prosocial Behaviors ..... 86

## **Introduction**

Prosociality refers to actions that are beneficial to others such as helping, sharing, comforting, informing and cooperating. These behaviors contribute in vital ways to the development of social skills and emotional competence, in addition to promoting affectively positive relationships (Eisenberg, Spinard, & Knafo, 2015). Many studies have shown that prosocial behavior emerges in the first and second year of life (Davidov, Zahn-Waxler, Roth-Hanania, & Knafo, 2013; Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011; Warneken & Tomasello, 2006, 2007). The explanations behind its early emergence have been debated in recent years. On one side of the debate, evolutionists consider prosociality to be an innate behavior and track its emergence in very early stages of life (Davidov et al., 2013; Hamlin, Wynn, Bloom, & Mahajan, 2011; Warneken & Tomasello, 2006, 2007). On the other side, developmental researchers suggest that prosociality is developed and learned over time, partially as a result of adults' reinforcement and praise (Dahl, Campos, & Witherington, 2011), but also due to children's increasing attunement to the consequences of their behavior for others (Turiel, 2014). Keeping this in mind, it is also increasingly clear that different types of prosocial behavior may have different roots and psychological mechanisms, each of which requires closer examination (Dunfield et al., 2011).

Most recent studies of young children's prosociality are based on controlled laboratory experiments in which children interact with an adult stranger; yet it is important to complement this work by examining how prosocial behavior emerges in everyday interactions with particular relationship partners. Arguably, as elaborated below, sibling relationships may be a unique context for the emergence and development of prosocial behaviors, although these forms of sibling interaction are rarely studied. The present study aims to investigate the development of prosocial behaviors such as instrumental helping, sharing, comforting and protecting among 2- to 6-year-old siblings, as well as the behavioral cues that are more or less likely to elicit prosociality in this relationship. In particular, the study will focus on age-related changes and birth order differences in sibling prosociality.

### **Categorizing Prosocial Behavior**

Prosocial behavior refers to voluntary actions that are beneficial to another person (Eisenberg et al., 2015); it differs from altruistic action, which is a more specific type of

prosociality that implicates some cost to the self (Svetlova, Nicholas, & Brownell, 2010). Prosociality was a prevalent research area in the 1970s and 1980s (as cited in Eisenberg et al., 2015). Subsequently, attention to this area decreased until recent advances in biology, neurology and social cognition brought the attention of researchers to phylogeny in terms of heredity and ontogeny in the matter of early emergence of these behaviors (Eisenberg et al., 2015). In general, as elaborated below, recent research implies that earlier work underestimated the cognitive abilities of young children in terms of recognizing other's needs and intervening correspondingly. Additionally, prior research did not differentiate precisely between different forms of prosociality and used the term to refer to a broad range of heterogeneous behaviors.

Prosocial behaviors take a variety of forms such as instrumental helping, sharing, comforting, cooperating and informing. Researchers have attempted to categorize prosocial behavior in a variety of ways, including motives (Hay & Cook, 2007), phylogenetic predispositions (Warneken & Tomasello, 2009), as well as needs and initial negativity cues (Dunfield et al., 2011).

With respect to the motives underlying prosociality, Hay and Cook (2007) proposed three general strands in the emergence of early prosociality based on the child's motivation in interacting with others; these include feeling for another, working (playing) with another and ministering to another. In this categorization, feeling for another consists of emotions such as empathy, friendliness and affection; working with another entails cooperative actions to solve problems, helping others reaching their goals, and sharing; and ministering to another refers to the ability to respond to another's needs and wishes in terms of nurturing and comforting. One key limitation of this framework vis-à-vis the emergence of prosociality is that it does not emphasize the cognitive ability to identify a need. In this sense, it confounds different types of prosociality that may have distinctive underlying cognitive mechanisms such as cooperation, sharing and helping into one category (Dunfield & Kuhlmeier, 2013). Accordingly, this framework limits our understanding of how particular prosocial behaviors may emerge earlier or later depending on their cognitive prerequisites.

On the contrary, Warneken and Tomasello (2009) take the ontogenetic and phylogenetic roots of prosociality into account in terms of cognitive and motivational components and they suggest four types of prosocial behaviors: instrumental helping, sharing, comforting and informing. This classification relies on observable behaviors such as handing an out-of-reach

object to an adult. One limitation of this approach is the fact that prosocial behaviors are often multifaceted, and thus it is not feasible to differentiate the intentions of children, blurring the lines between different categories of prosociality. For example, handing an out-of-reach object to an adult could be classified as instrumental helping in terms of assisting an individual to reach her goal but also comforting in the sense of alleviating negative states.

For this reason, in classifying prosocial behavior, rather than simply noting the prosocial behavior itself, Dunfield (2014) puts emphasis on the initial negativity cue that leads the child to respond to the other's needs. She categorizes prosocial behavior based on three forms of needs: instrumental need leads to helping, unmet material desire leads to sharing, and emotional distress leads to comforting. Since needs are distinctive and they are manifested differently (have different cues), they require different interpretation and interventions (Dunfield et al., 2011). Furthermore, it is argued that acting prosocially involves three steps: (1) recognizing the behavioral cues of need, desire or distress, (2) the ability to identify an appropriate intervention to alleviate the negative state, and (3) the motivation to act correspondingly (Dunfield, 2014). Importantly, since the development of these steps is related to age, varies across types of prosocial behavior and is likely to be different across relationships (e.g., familiar vs. unfamiliar individuals, siblings vs. peers etc.), it is the most useful framework for examining age-related changes and birth-order effects on siblings' prosociality. Also, through this approach, it is feasible to examine different kinds of cues that may or may not provoke prosocial behaviors.

It is worth noting that prosocial behavior is a response based on the helper's interpretation of the other's need, which might be different from the recipient's perception of their own need (Dunfield et al., 2011; Dunfield & Kuhlmeier, 2013). For example, a person in need could have a goal-directed need (e.g., finding a lost teddy bear) which would most clearly be met by instrumental helping (i.e., searching for the bear) but the helper instead perceives the need to be emotional (e.g., alleviating distress) and responds accordingly (i.e., by comforting). In this sense, inasmuch as this framework was developed in an experimental setting in which cues are carefully isolated and controlled (e.g., pain represents emotional need, outstretched hand represents instrumental need or material desire depending on the situation), it may not translate immediately to a naturalistic setting. That is, in naturalistic settings, many cues could co-occur, leading to various appropriate prosocial responses (e.g., either helping or comforting could be an appropriate response to a demonstration of instrumental need accompanied by distress).

Furthermore, the nature of the cues eliciting prosocial behavior may be somewhat different in a naturalistic setting in which children are interacting with familiar others (as compared to unfamiliar adults in an experimental setting). For instance, prosocial behavior with familiar others may occur somewhat more frequently, since children's history of repeated interactions with others may make them more sensitive to subtle cues indicating the other's need. Thus, our study provided a useful test of how this framework can be applied to the study of siblings' naturalistic prosocial behaviors in the home.

### **Different Perspectives on Early Emergence of Prosocial Behavior**

Many researchers agree that prosocial behavior is rooted in infancy (Davidov et al., 2013; Svetlova et al., 2010; Warneken & Tomasello, 2006; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). However, they have different perspectives on what prompts the early emergence of these behaviors. In this regard, Paulus (2014) proposes four distinct models explaining the emergence of prosocial behavior: emotion-sharing, goal-alignment, social interaction and social normative.

“Emotion-sharing models” assume that empathic concern for others is the motive for acting prosocially (Paulus, 2014). Since infants younger than a certain age do not have the ability to differentiate themselves from others, they seek to comfort themselves in the presence of others' distress (Hoffman, 2000). After gaining the capacity for self-other differentiation in the second year of life (Hoffman, 2000), infants experience empathy for others and start to act on behalf of others. Consistent with this model, researchers have found that children who have the ability to distinguish themselves from others on a mirror self-recognition task tend to be more empathic and prosocial (Bischof-Köhler, 2012; Zahn-Waxler et al., 1992). However, there are studies demonstrating that the capacity for self-other differentiation and empathy emerge earlier (Hamlin et al., 2011) and children younger than 2 years old also behave prosocially (Davidov et al., 2013; Hay & Cook, 2007; Svetlova et al., 2010; Warneken & Tomasello, 2006, 2007, 2008).

On the contrary, the “goal-alignment model” assumes that children's goal understanding is sufficient for acting prosocially and there is no need for empathic concern in early prosociality (Paulus, 2014). This model, building on the lack of self-other differentiation in infancy, proposes that infants may consider others' goal-directed actions to be their own goal, which provides motivation for them to act prosocially. One study on 17-month-olds suggests that helping occurs as a result of a goal-contagion process in the absence of empathy by showing that children help a

ball-shaped non-human agent who failed reaching a “goal” (as apparently inferred by the child) because its way was blocked by a barrier (Kenward & Gredeback, 2013; for other examples of goal-directed helping, see Warneken & Tomasello, 2006, 2007).

On the other side, the “social interaction model” proposes that interaction with other people is pleasurable for children (Paulus, 2014); this positive affect is referred to as “social joy” (Dahl et al., 2011). This model posits that some actions are not motivated to benefit others but are instead simply aimed at interacting with others and performing joint activities (e.g., helping parents doing the housework) (see Dahl et al., 2011).

Contiguous to the social interaction model, the “social normative model” emphasizes the role of the social environment in fostering the emergence of prosocial behaviors (Paulus, 2014). While interacting with others, children engage in some behaviors that could be construed as prosocial and for which they are praised (Dahl et al., 2011). Moreover, some studies show that children are more likely to act prosocially when their parents scaffold their behavior (for examples, see Paulus, 2014). In one study, 44- and 50-month-olds’ prosocial behavior increased after an adult (i.e., the experimenter) requested prosocial intervention (e.g., “That is a time where your help is needed”, “Can you help me?”) (Denham, Mason, & Couchoud, 1995). However, other studies suggest that young children’s helping behavior does not depend on parents’ indirect or direct support (i.e., by pointing out the problem or requesting the help) (Warneken & Tomasello, 2013) and material rewards might actually deter future prosocial behavior (Warneken & Tomasello, 2009).

Considering all of these models, one explanation likely does not cover all prosocial behaviors, particularly because it is evident that there is no relationship between different prosocial behavior subtypes such as helping, sharing and comforting (Dunfield et al., 2011; Dunfield & Kuhlmeier, 2013) and there are different psychological mechanisms that are posited to underlie prosocial behavior subtypes (Dunfield et al., 2011). Providing further support for this proposition, EEG analysis has revealed distinct neural patterns related to instrumental helping and comforting (Paulus, Kühn-Popp, Licata, Sodian, & Meinhardt, 2012). Thus, it is important to investigate the development of different prosocial behavior subtypes separately after their initial emergence. In the following section, the literature on the development of prosocial behavior subtypes is reviewed. To limit the scope of the review and to focus on the developmental period

that is investigated in this study (i.e., age 2 to 6), only research findings on children up to age 8 are discussed.

### **Early Development of Prosocial Behavior Types**

**Instrumental helping.** Helping is characterized by assisting others to reach their goals (assuming that this assistance is not better categorized as sharing). Infants as young as 3 months of age prefer helpful to non-helpful puppets (Hamlin et al., 2011). Indeed, helping behavior is one of the earliest types of prosocial behavior that emerges in life (Warneken & Tomasello, 2006; Zahn-Waxler et al., 1992). By 14 months of age, infants spontaneously and without any reward hand objects to adults who cannot reach them (Warneken & Tomasello, 2007).

Additionally, 18-month-old infants help adults who have problems achieving their goals in different situations (Warneken & Tomasello, 2006), even when the adults did not request help verbally (Svetlova et al., 2010; Warneken & Tomasello, 2008). Children also tend to help even if it is costly for them, for instance when they need to stop playing with their new toy to help another person (Warneken & Tomasello, 2008) or when helping requires overcoming physical obstacles (Warneken et al., 2007). Furthermore, research has shown that after the second birthday, a high percentage of children engage in instrumental helping (Dunfield & Kuhlmeier, 2013). Inasmuch as toddlers already engage in high levels of instrumental helping, some research has shown that this form of prosociality does not increase from 2 to 4 years of age (Dunfield & Kuhlmeier, 2013); these authors suggest that children may have developed an understanding of others' goal-directed needs by age 2. Besides helping that requires doing an action, research has shown that children as young as 12 months can inform another person about the location of object he/she was searching for by pointing at the object (Liszkowski, Carpenter, Striano, & Tomasello, 2006).

**Behavioral cues indicating instrumental need.** Instrumental need can be expressed in various ways, including verbally asking for help (e.g., "can you give me the crayon?") or via nonverbal behaviors (e.g., outstretched hand; Dunfield et al., 2011). Previous research has shown that helping behaviors that require a complex understanding of cues and need inferential steps on how to intervene take more time to emerge. In one study, Svetlova et al. (2010) found that 18-month-olds needed more explicit communication cues than 30-month-olds to understand that specific acts are required to meet the other's needs (e.g., giving a blanket to an adult when she is cold). However, another study examined the influence of adults' expression of sadness vs.

neutrality as a cue of need on infants' instrumental helping and they found that experimenter's expression of sadness did not enhance prosociality in 18- to 21-month-old infants over and above the effects of cues that represented blocked goals (e.g., reaching for the dropped marker, bumping into the closed cabinet door) (Newton, Goodman & Thompson, 2014). Accordingly, these data suggest that 18-month-olds can recognize and react to nonverbal cues that represent blocked goal-directed actions but may not be as sensitive to emotional cues in deciding whether to engage in instrumental help. Another study showed that 2-year-old bystander toddlers help spontaneously even before adults realize that a problem had occurred. That is, children responded to situational signs of need (i.e., a can was dropped on the floor) even though the experimenter apparently did not notice that the can had fallen—this behavior was referred to “proactive helping” (Warneken, 2013).

Summarizing the literature, it is evident that children in the second year of life start to help others in simple contexts. In turn, their helping behaviors become more sophisticated by their second birthday through developing the ability to recognize increasingly implicit cues to others' goals, such as by observing signs of need without being directly requested by help by the person in need.

**Sharing.** In contrast to helping, sharing is comparatively rare and later-developing since it requires an understanding of inequality and also necessitates giving up valuable resources (Brownell, Svetlova, & Nichols, 2009; Dunfield & Kuhlmeier, 2013; Hay, 2006). In one study, Brownell and colleagues (2009) gave children a choice between distributing snacks only to themselves (0,1) or to themselves and the experimenter (1,1) by pulling a handle attached to the snack tray. They found that 25-month-old infants, but not 18-month-olds, shared their food where there was no personal sacrifice needed (i.e., does not encompass any cost to sharer). Dunfield and Kuhlmeier (2013) reported that sharing was not frequent in children from 2- to 4-year-olds in the absence of explicit cues (such as an outstretched hand) or when cues were made implicit (e.g., simply looking into the child's bowl).

Older preschoolers also show their willingness to share resources even when the recipients are absent. One study demonstrated that children between 4- and 5-years chose an option with equal distribution of resources over a selfish option even when the recipient was not present (Moore, 2009). Moreover, studies on actual resources and also hypothetical scenarios illustrate that children between 5- to 7-years show a preference for equality of distribution of

resources (for examples, see Warneken & Tomasello, 2014). Even so, children's and adults' judgments of equitable resource distribution have been shown to be different. Through the "giving game"—in which two puppets with different proportions of chips would give some to the children, 4-year-olds were exclusively sensitive to the absolute number of chips shared, 5-year-olds showed some sensitivity to the proportion of chips shared, and adults focused exclusively on proportion when they evaluated the niceness of a puppet (McCrink, Bloom, & Santos, 2010).

Related to this age-related progression, recent studies have focused on the development of sensitivity to the principles of equality (fairness) in children. In one study, Fehr and colleagues (2008) gave a candy to children between 3- and 8-years old; in the "prosocial game", children could decide whether their partner would receive one candy (1:1) or none (1:0). Additionally, in the "sharing game", children could choose between equal distribution (1:1) which would be costly for them compared to the unequal one (2:0). The results showed that at age 3-4, children's behaviors were self-interested whereas 7-8 year-old children preferred resource distributions that eradicated advantageous or disadvantageous inequality. Likewise, 6- to 8-year-old children prefer to gain nothing by discarding a resource than having unequal distribution of resources, which suggests a manifestation of "inequity aversion" in children—that is, "individuals' tendency to respond negatively to being given too much or too little of a reward and therefore attempt[ing] to correct inequity" (Shaw & Olson, 2012, p. 382).

At the same time, young children are well known for their reluctance to share their own possessions, underscoring the importance of considering children's understanding of ownership in their decisions about sharing. In one study, 18- and 30-month-olds were less likely to give up their blanket or their favorite toy from home to help another person in need, as compared to their willingness to give up a similar object that they did not own (Svetlova et al., 2010). Another recent study took into account ownership understanding and examined its relationship to other-oriented sharing in 18- and 24-month-olds (Brownell et al., 2013). They found a positive association between ownership understanding and sharing. These findings suggest that early forms of ownership understanding may bring awareness of the others' status regarding resources and the emotions resulting from deprivation from them.

Also germane to children's sharing behavior is the finding that children's understanding of ownership rights advances over the preschool years and is differentiated from possession

rights. Four-year-old children understand that ownership is transferred when it is given as in a gift and 5-year-olds realize that a purchased item is owned by the buyer (Nancekivell, Van de Vandervoort, & Friedman, 2013). Also by the late preschool years, children identify a person who makes a/an work/object and a person who first found a non-owned object as an owner (Nancekivell et al., 2013). Despite the fact that the concept of possession is similar to ownership, possession has some specific features that make it different. Possession rights are “limited in time, dependent on continuing contact or use and subordinated to the rights of owners of the same property” (Ross, 1996, p. 90). More broadly, research suggests that the differentiation between ownership and possession concepts begins at the second year of life and children’s arguments and behaviors imply that they view ownership rights as superseding possession rights when the two principles come into conflict (Ross, 1996).

***Behavioral cues indicating inadequate distribution of resources.*** In part, low rates of sharing may be explained in terms of the difficulty in recognizing the need in the recipients because of a lack of explicit behavioral cues. Dunfield and Kuhlmeier (2013) found that sharing was not frequent in children from 2- to 4-years in the absence of explicit cues (such as an outstretched hand) or when cues were made implicit (e.g., simply looking into the child’s bowl). Children are more likely to share when needs or desires are made obvious in terms of non-verbal cues such as an outstretched hand (Dunfield et al., 2011) or verbal cues such as requests (Brownell et al., 2009). In this regard, Dunfield et al. (2011) found that infants as young as 18- and 24-month-old were willing to share their resources with an experimenter who had none when the recipient showed her need by outstretching her hand. However, considering that the experimenter was an adult, it is possible that the outstretched hand was interpreted as a command to share that the child was compelled to obey rather than to simply highlight the inadequate distribution of resources (Brownell et al., 2009; Dunfield et al., 2011). Additionally, infants’ sharing might be supported by others’ affective displays. In one study, the experimenter was sad because of losing her balloon accidentally and 1.5- to 2-year-old toddlers offered one (in some cases two) of the two balloons that they possessed to the experimenter (Vaish, Carpenter, & Tomasello, 2009; for more examples, see Dunfield et al., 2011).

Taken together, these studies suggest that sharing likely emerges during the second year of life, although it is characteristically costly for the child and likely to be less frequent than instrumental helping. Even so, by the age of 6, but perhaps not before, children consider equality

(fairness) as a key principle in their decisions about the allocation of resources. Additionally, it is argued that in the second year of life struggles over belongings (e.g., toys) in terms of ownership vs. possession rights become common between peers and siblings, since at this age children start to attain an understanding of ownership and possession.

**Comforting.** Comforting as a response to others' distress requires social-cognitive processing to infer the others' internal states, as well as self-regulatory mechanisms, and consequently it emerges comparatively later than helping and sharing (Thompson & Newton, 2013). As Hoffman (2000) describes, infants are born with empathic distress that is seen in reactive crying; however, veridical empathic distress that leads to comforting behaviors emerges after the second year of life (for a contradictory argument, see Davidov et al., 2013). Furthermore, young children experience personal distress through emotion contagion when they witness others' distress or pain since they do not have the ability to differentiate themselves from others (Hoffman, 2000). After their second birthday, children's capacity for self-other differentiation improves and therefore empathic responses increase. Consistently, research has shown that toddlers' expression of empathic concern and comforting increase significantly from 18- to 24-months towards their caregiver (Zahn-Waxler et al., 1992). In contrast, Dunfield and colleagues (2011) found that none of the children (18- and 24-month-olds) in their experiment engaged in comforting behavior with the experimenter. These findings imply that early comforting behaviors may be selectively directed towards familiar vs. unfamiliar people.

Preschool children's empathic concern seems to be selectively directed toward individuals whose distress is interpreted as authentic. For example, 3-year-olds sympathize with a person whose expression of distress is befitting to the harm (e.g., a box's lid closed on the adult's finger) but not for one whose expression of distress is not befitting to the harm (e.g., a box's lid closed on the adult's sleeve) (Hepach, Vaish, & Tomasello, 2013). Similarly, 1.5- to 2-year-old children display more empathic concern and prosocial behavior toward a victim who is harmed than unharmed (Vaish et al., 2009). Furthermore, as children grow older, they are less likely to show empathic concern when they cause the distress than when they witness it (Zahn-Waxler et al., 1992).

***Behavioral cues indicating negative emotionality.*** Infants may need substantial communication cues and scaffolding from others to engage in comforting behaviors (Dunfield et al., 2011). Research suggests that when caregivers provide this support, they can assist children

to recognize the cues that are present in emotionally arousing situations. For example, in emotion-related tasks wherein an understanding of others' internal states is needed to intervene correspondingly, 18-month-olds rarely engaged in prosocial actions unless they received explicit communication cues (e.g., stating general need: "I need something to make me warm"; labeling the object: "blanket!") and scaffolding from adults (e.g., specific instructions about how to help or comfort: "can you give me the blanket?") (Svetlova et al., 2010). Yet, still other studies show that the display of emotion cues is not necessary for empathizing with a person in distress and therefore comforting. In one of the tasks in another study, the participant and the experimenters (E1 and E2) each drew a picture. After finishing the drawing, in the harm condition, E2 in a mildly aggressively tone stated that she was going to tear E1's drawing up and then she did it, whereas in the neutral condition E2 said the same things in the neutral voice and then tore up a blank sheet of paper. In both conditions, the victim (E1) did not show any signs of emotion (Vaish et al., 2009). Results indicated that children as young as 18 months can sympathize with a person in distress (e.g., by hugging and patting, offering their own belongings to E1) in the absence of overt emotional cues; the authors argue that this occurs via affective perspective taking— "by imagining or inferring what the other person is feeling based on various non-emotional and situational cues and by putting oneself in the other's place" (Vaish et al., 2009, p. 534).

Summarizing the literature, comforting behavior requires self-regulatory mechanisms, self-other differentiation and emotion recognition abilities, thus it takes more time to develop than other forms of prosociality. With this in mind, early forms of comforting may also require more explicit communication cues and scaffolding from adults and may be initially performed selectively towards family members rather than unfamiliar people.

### **Prosocial Behavior Between Siblings**

There is a high level of interaction between siblings (Abramovitch, Corter, & Lando, 1979; Dunn, 1983) and the sibling relationship serves as a unique context for many forms of interaction related to prosociality, including reciprocity and imitation (Dunn, 1983), attachment (Stewart, 1983), caretaking (Howe & Rinaldi, 2004; Weisner & Gallimore, 1977) and teaching (Howe et al., 2015). During these interactions between two highly familiar children, understanding of others' feelings, needs and negative states is fostered and facilitated (Dunn, 1983; Howe, Ross, & Recchia, 2011; Ram & Ross, 2008). For example, Dunn, Kendrick and

McNamee (1981) found that with the birth of a sibling, talking about the feelings and needs of others in families is increased. With regard to this, however, few studies have focused directly on the development of prosociality between siblings (Abramovitch et al., 1986; Dunn & Munn, 1986; White et al., 2014).

Extant research on sibling prosociality generally suggests age-related increases in this form of behavior, and also implies birth order effects, such that older siblings are more prosocial than younger siblings. A longitudinal study of sibling interaction at home showed that although the overall prosocial behavior scores of younger and older siblings both increased over time, across a period of 3.5 years, older siblings (i.e., 4- to 8-year-olds) were consistently two times more prosocial than their 2- to 6-year-old younger counterparts (Abramovitch et al., 1979; Abramovitch et al., 1986; Pepler, Abramovitch, & Corter, 1981). In another early study of siblings' prosociality, Dunn and Munn (1986) examined the development of prosocial behaviors between siblings when the younger sibling was 18- and 24-months-olds. The frequency of these behaviors in older siblings was shown to be almost three times more frequent than the younger sibling at both time points. However, the age gap between siblings varied from 12 to 57 months, and these results do not clarify whether birth order differences in prosocial behavior were due to chronological age or firstborn siblings' role as an older child. Conversely, Abramovitch et al. (1986) found that first-borns were more prosocial than second-borns at the same age (e.g., comparisons of each child's behavior when they were 6 years old), suggesting the presence of role effects. Another recent study on children with siblings between 3- and 8-years illustrated that regardless of their age, the youngest children in a family were less willing to share than older siblings (Fehr et al., 2008). This latter finding provides some suggestive evidence that role effects may generalize beyond sibling interactions.

A few studies have examined particular forms of sibling prosociality. In a study specifically examining siblings' spontaneous sharing, White and colleagues (2014) found that older siblings shared more than younger siblings when they were 6 and 3 years old respectively but not three years later (when they were 9 and 6 years old). Also, this study showed no stability of sharing for younger or older siblings over time. These findings regarding sibling prosociality imply the importance of birth order in acting on behalf of others. With regard to the siblings' birth order, another study examined sibling teaching, which is related to prosociality inasmuch as

it partially overlaps with informing, and they found that first-born siblings engaged in teaching more than second-born siblings (Howe, Della Porta, Recchia, & Ross, 2016).

In turn, in a study of comforting, in the context of maternal separation in a laboratory setting, more than half of the preschoolers (age range from 3 to 5 years) attempted to alleviate their younger siblings' distress (14-month-olds) regarding their mother's absence by hugging, kissing, giving reassurance, providing a verbal statement (e.g., "Don't cry") and/or distracting (e.g., "Here's the ball") when they observed their sibling's distress and discomfort (Howe & Rinaldi, 2004; Stewart, 1983). However, these studies were not designed to examine birth order effects on prosociality; that is, the younger sibling's comforting behaviors did not come into consideration.

Unfortunately, the contributions of this literature to our understanding of prosociality among siblings is currently limited by varied definitions and mixed classifications used across studies. For instance, Abramovitch and colleagues (1986) included a very broad range of behaviors in a general category of prosociality including affection, sharing, helping, comforting, praise, and cooperation. Similarly, in Dunn and Munn's (1986) study, prosocial behavior referred to helping, sharing, comforting, giving appropriately and cooperation; although they originally distinguished between these subtypes, categories were combined for the purpose of analyses. Likewise, in their definition of sharing, White et al. (2014) did not exclude joint play, which is perhaps better conceptualized as cooperation rather than sharing. Thus in general, studies on siblings' prosociality have not tended to specify particular subtypes of prosocial behaviors, which limit their contributions to our understanding of developmental patterns for each type.

In addition, when studies examine the cues that lead to prosocial behavior, these cues are often varied and/or inadequately defined. For instance, in their study of prosocial behavior between siblings, Dunn and Munn (1986) coded actions as whether they are solicited or not. However, they provided no description of how this distinction was made in their research. Even more, most studies do not use cues to define the behavior or these cues are used very narrowly (Abramovitch et al., 1986; White et al., 2014). For instance, White and colleagues in their study (2014) focused on "spontaneous" sharing (perhaps implying an absence of explicit cues), rather than differentiating sharing resulting from varied cues/needs.

## The Current Study

The aim of the current study was to add to the literature on sibling prosociality by charting the naturalistic development of the prosocial behavior subtypes of instrumental helping, sharing, comforting and protecting between siblings over a period of 2 years. Moreover, this study examined developmental changes in these behaviors from 2- to 6-years, as well as birth order effects on siblings' prosociality.

Two types of prosociality, that is, informing and cooperating, were excluded from the current study. Informing refers to transmission of information between individuals. In some respects, informing is a subtype of instrumental helping in which children provide information to others to help them reach their unfulfilled goals (Liszkowski, Carpenter, Striano, & Tomasello, 2006). As such, this type of informing was encapsulated within the instrumental helping category. On the other hand, other types of informing (e.g., "this is how you ride a bike") overlap with sibling teaching, which has already been examined in the current dataset (Howe et al., 2015). Thus, this type of informing was excluded to avoid conceptual overlap with previous analyses. In turn, cooperating refers to "the coordination of behavior in time and space between individuals without the benefit of an outside physical connection" (Brownell, 2011, p. 1), which often happens by way of joint play between children. Children's cooperative joint actions are in service of shared goals, which are beneficial not only for others but also for children themselves. Due to this, by definition, cooperation is considered to be conceptually distinct from other types of prosocial behavior. In more practical terms, another reason to exclude cooperation from the current study is the overwhelming frequency with which it occurs in sibling relationships; indeed, depending on how it is defined, much of siblings' joint interaction could be classified as cooperative.

In addition to helping, sharing, and comforting, protective forms of prosocial behavior were considered in this study. Protecting is a proactive behavior aimed to prevent others from being hurt (e.g., grabbing someone's wrist to prevent them from falling); to date, this form of prosociality is rarely studied. These actions were included in the category of prosociality in the present study because they are meant to benefit others. It is also interesting to examine a type of prosociality in which the recipients themselves may not be aware of their own needs and to investigate possible differences with the other subtypes. Arguably, this type of prosociality may

also be evident among siblings, given the caretaking roles commonly adopted by older brothers or sisters (Howe & Rinaldi, 2004; Stewart, 1983).

### **Elaboration of Hypotheses**

Based on the literature previously discussed, the current study aimed to investigate several facets of prosociality among siblings in early childhood. Specifically, goals included examining behavioral cues indicating siblings' needs (i.e., first aim), different responses to siblings' manifestations of need (i.e., second and third aims), and engagement or failure to engage in prosocial behaviors (i.e., fourth, fifth and sixth aims). Specific research questions pertaining to each issue and corresponding hypotheses are elaborated below.

**Behavioral cues indicating siblings' needs.** The first aim was to examine *the frequencies of different behavioral cues as a function of time and birth order*. Types of behavioral cues included direct verbal request (DVR), indirect verbal request (IVR), nonverbal request (NVR), negative emotionality (NEMO), other observable signs of need (OOS), and parental intervention (PINT). Since siblings at time 1 were two years younger than at time 2, it was expected that they would have more needs to be addressed by others (i.e., that they would be less able to autonomously meet their own needs autonomously) and thus there would be more expression of needs at time 1 than at time 2. With the same scope, we hypothesized that younger siblings would express more needs than older siblings; that is, older siblings would receive more behavioral cues than younger siblings. Since children at time 1 (i.e., 2- and 4-year-old) were not as verbally competent as at time 2 (i.e., 4- and 6-year-old), it was expected that nonverbal cues, negative emotionality, and other observable signs of need would arise significantly more at time 1 than at time 2. However, due to the fact that children became more verbal at time 2, we expected that verbal cues would be expressed more at time 2 than at time 1. Considering siblings' linguistic abilities, it was also expected that older siblings would receive nonverbal cues, negative emotionality and other observable signs of need more than younger siblings. On the other hand, we expected that younger siblings would receive direct and indirect verbal requests more than older siblings. We had competing hypotheses with respect to parental scaffolding of older vs. younger siblings' prosociality. Younger children may need parental scaffolding to act on behalf of others more than older children (Dunfield et al., 2011; Svetlova et al., 2010). Therefore, it may be the case that younger siblings receive more parental intervention as a cue compared to their older siblings. Conversely, considering older siblings' role-related

responsibilities within the sibling relationship (Howe & Rinaldi, 2005; Weisner & Gallimore, 1997), it is also possible that older siblings may receive more parental intervention to encourage them to be prosocial compared to their younger counterparts.

With regard to the siblings' birth order, given the complementary roles inherent in sibling relationships, we expected that 4-year-old first-borns would receive more behavioral cues from their 2-year-old younger siblings than 4-year-old second-borns from their 6-year-old older siblings. In particular, it was expected that 4-year-old first-borns would receive negative emotionality and nonverbal requests more than 4-year-old second-borns due to the fact that 4-year-old first-borns were interacting with 2-year-olds who were less verbally competent. Conversely, we expected that 4-year-old second-borns who interacted with more linguistically competent 6-year-olds would receive verbal requests more than 4-year-old first-borns who interact with 2-year-olds.

**Different responses to siblings' manifestations of need.** The second research aim was to examine *the frequencies of responses to the manifestation of need as a function of time and birth order*. Possible responses included addressing, rejecting, or failing to respond to their siblings' needs. Considering age-related changes, it was expected that children would address their siblings' needs and engage in prosociality more at time 2 than at time 1. Correspondingly, we expected that siblings would reject engaging in prosociality more at time 1 when they were younger than at time 2 (Brownell et al., 2009; Dunfield & Kuhlmeier, 2013). Based on the literature previously discussed, younger children may have difficulties in detecting behavioral cues and consequently engage in prosocial behaviors less frequently (Dunfield et al., 2011; Svetlova et al., 2010). In contrast, since older children are cognitively more developed than younger children and may be more likely to detect behavioral cues indicating a need, it was expected that chronologically older children would explicitly address or reject their siblings' needs more often than failing to respond to them. Even so, overall, due to the intimacy of siblings' relationships, we expected that siblings would address or reject expressions of need more than fail to respond to them because of lack of detection of cues. It was also expected that parents would act on behalf of younger siblings more than on behalf of older siblings; that is, younger children would fail to respond due to their parent's intervention more than older children. Moreover, due to the first-born sibling's role within their relationship as evident by previous research (Dunn & Munn, 1986; Howe, DellaPorta, Recchia, & Ross, 2015; White et al.,

2014), it was expected that first-born siblings would engage in prosocial behavior at age 4 more often than second-born siblings at the same age (i.e., first-borns at Time 1 and second-borns at Time 2).

The third research aim was to examine *the potential association between types of behavioral cues and siblings' responses to distinct manifestations of need*. In other words, this study examined whether some cues were more likely to be addressed than others. Previous studies have indicated that some cues such as an outstretched hand (Dunfield et al., 2011), and direct request (Brownell et al., 2009) are particularly salient or persuasive for young children; that is, children are more likely to address others' needs after receiving those cues. Thus, it was expected that children would be particularly likely to address their siblings' need when the need was expressed as nonverbal request or direct verbal request. In addition, contrary to experimental research suggesting that children's prosocial behavior (i.e., particularly comforting) does not depend on the display of distress or emotional cues (Svetlova et al., 2010; Vaish et al., 2009), we expected that in naturalistic interaction between siblings, some displays of negative emotionality might be very conspicuous (e.g., crying). Therefore, we expected that children would be more likely to act on behalf of others in response to negative emotions. On the contrary, behavioral cues such as indirect verbal request and other observable signs of need are implicit in nature, and thus may require more complex understanding of cues to be detected consistently (Svetlova et al., 2010). Thus, we expected that children would not respond as frequently to these cues, or that their parents would intervene before themselves upon receiving the aforementioned cues.

**Prosocial behaviors types.** The fourth research aim was to examine *the frequencies of engagement or failure to engage in different prosocial behavior types as a function of time and birth order*. The four types of prosociality that formed the focus of this investigation were helping, sharing, comforting, and protecting. Instrumental helping—an action to assist others to reach their instrumental goals, is shown to emerge as early as the first birthday (Warneken & Tomasello, 2006; Zahn-Waxler et al., 1992). Based on prior studies, it was expected that children as young as 2 years old in our sample would frequently engage in instrumental helping. Specifically, it was expected that chronologically younger children in this sample would particularly engage in more instrumental helping than sharing, comforting or protecting since the latter categories requires more sophisticated cognitive development; we expected this gap between the subtypes of prosociality to diminish between 2 and 6 years. As previous studies

indicate that sharing emerges after the second birthday (Brownell et al., 2009; Dunfield & Kuhlmeier, 2013; White et al., 2014), it was expected that children as young as 2 years old in our sample would share occasionally. However, the frequency of sharing was expected to increase with age. Comforting, as a supportive act that is intended to alleviate others' negative emotional states, emerges during the second year of life (Dunfield et al., 2011; Svetlova et al., 2010). Building on previous studies, it was expected that older siblings (i.e., 4- and 6-year-olds) in our sample would engage in comforting behaviors with their sibling more than younger siblings (i.e., 2- and 4-year-olds). Similar to sharing and comforting, it was expected that protecting would be later developed and therefore, older siblings would protect their siblings from harm more than younger siblings. Given that protecting necessitates anticipation of a potential need that might cognitively develop later in life (Haywood, 1980), it was expected that children would engage in protecting less than helping, sharing, and comforting. With regard to the first-born siblings' role within their relationship as discussed previously, we expected that first-borns would help, share and comfort their younger siblings more than second-borns at the same age. Considering that protecting might encompass some features of caretaking (Stewart, 1983; Weisner & Gallimore, 1997), we expected that birth order would influence siblings' protecting behaviors as well; that is, firstborns would protect their siblings more than secondborns.

The fifth research aim was to examine *the association between types of behavioral cues and siblings engagement in different prosocial behaviors*. Based on previous research, children are more likely to help instrumentally and share in response to an unambiguous display of need than in the absence of such cues (Brownell et al. 2009; Dunfield et al., 2011). Therefore, it was expected that children would selectively engage in helping and sharing in response to direct verbal request and nonverbal request. In contrast, with increasing age, we expected children to more often help instrumentally and share in response to needs that require more inferential processing, including indirect requests or other observable signs of need. Moreover, as argued previously, children's understanding of emotional cues requires more sophisticated social-cognitive abilities, and early comforting necessitates substantial communication cues and scaffolding from adults (Dunfield et al., 2011; Newton et al., 2014; Svetlova et al., 2010; Warneken & Tomasello, 2006). Based on this, it was expected that verbal cues, negative emotional cues, and parental intervention would prompt more comforting behavior than nonverbal behaviors (e.g., hugging the knees, sitting quietly aside). However, we expected that

children's dependence on these explicit cues would decrease with age. Furthermore, in protecting situations, the harm had not happened yet, but the protector perceived the need. Thus, we expected that cues such as other observable signs of need would prompt more protecting than any other behavioral cues.

The last research aim was to examine *the frequencies of engagement in different subtypes of each form of prosocial behavior*. In terms of instrumental helping, we examined helping by doing an action and by providing information. Helping by doing an action might have more cost in terms of doing a physical action to help compared to providing information. Although it is argued that the costs of helping do not prevent children from being helpful (Warneken & Tomasello, 2008; Warneken et al., 2007), we expected that it would influence the likelihood of engagement vs. rejecting engaging in either of these behaviors. In particular, we hypothesized that when there was a behavioral cue indicating an instrumental need, children would be less likely to reject a request to help by providing information than by doing an action.

We investigated both costly vs. noncostly sharing, and ownership vs. possession sharing. In terms of costly vs. noncostly sharing, we hypothesized that children would fail to share more often when sharing was costly (i.e., giving up resources) than when it was noncostly (i.e., giving access to the resources without giving anything up). With regard to ownership vs. possession sharing, previous research has been shown that young children are less likely to share their own belongings than objects/resources that they do not own (Svetlova et al., 2010). Furthermore, during the second year of life children understand the differences between ownership and possession concepts and they favor owners over possessors (Ross, 1996). With this in mind, it was expected that possessors would share more than owners and also that possessors whose possession was owned by their sibling would share more frequently than when the object was not owned by anybody.

Moreover, we investigated both non-verbal (e.g., hugging, patting, distracting) and verbal comforting (e.g., "it's nothing serious", "It's ok, you gonna be fine."). Because both forms of comforting require complex understanding of emotional cues and the ability to select an appropriate strategy for alleviating distress, it was not clear which type of comforting was likely to be seen more frequently.

Finally, we investigated two types of protecting: physical and psychological protecting. Psychological protecting requires more abstract cognitive abilities in order to anticipate a

potential psychological harm rather than physical harm, which could be more tangible. Thus, we expected that children would engage in physical protecting more than psychological protecting.

## **Method**

### **Participants**

Participants in this study included 40 English-speaking middle class two-parent families with two children at the first time point (T1). At the second time point (T2), one family had left the study as they had moved out of the country. At time 1, the older siblings' mean age was 4.2 years ( $SD = .31$ ) and the younger siblings' mean age was 2.4 years ( $SD = .13$ ). Two years later at time 2, the older siblings' mean age was 6.3 years ( $SD = .42$ ) and the younger siblings' mean age was 4.4 years ( $SD = .21$ ). On average, the age interval between older and younger siblings was almost 2 years ( $M = 1.94$  years). There were equal numbers of all gender combinations of brothers/sisters. It should be noted that at time 2, a third child has been born into some families; interactions of the two older siblings with the baby were excluded from the current study. Parents' ages ranged between 23 and 48 years at the first time point. Mothers' and fathers' occupation and education varied widely (for additional details, see Ross, Filyer, Lollis, Perlman, & Martin, 1994).

### **Procedure**

At both time 1 and time 2, data were collected during six 90-minute sessions at home for a total of nine hours for each family at each time point. In half of the sessions (i.e., three per time point), children interacted in the home during periods when both their mothers and fathers were present at home (i.e., "mother/father" sessions), whereas in the other half, children were observed with only their mothers present at home (i.e., "mother" sessions). For the purpose of the present study, one session with children present with their mothers and one session with both their mother and father were randomly selected and coded at each time point. Even so, it should be noted that the data were collapsed over mother and mother/father sessions for analysis, as this study did not aim to examine the differences in children's behaviors between these two types of sessions. Also, at time 2, there were two families whose children were only observed with the presence of their mothers, as their parents had separated between the two time points. Thus, for these two families the data were prorated (i.e., the frequencies were doubled) in order to

compensate for the data that were missed for the mother/father sessions. Overall, at time 1, 40 mother sessions and 40 mother/father sessions were coded ( $n = 80$ ), whereas at time 2, 39 mother sessions as well as 37 father sessions were coded ( $n = 76$ ), for a total of 156 sessions. Given that one key focus was a comparison across time points, the family who left the study at time 2 was excluded from analyses at time 1.

For consistency reasons, two trained observers were assigned to conduct observations for each family. The observer did not interact with the children or their parents and she responded minimally to any comments or questions directed to her by family members during the observation. Family members were instructed to behave normally (e.g., playing with their toys, doing their routines) and ignore the presence of the observer. Using electronic devices (e.g., watching television) and accepting visitors were not allowed during the observation period. Each session was preceded by a warm-up period so that children could become accustomed to the presence of the observer. Using a two-track audiotape, the observer was able to record siblings' verbal interactions with each other and with their parents on one track and simultaneously narrate the children's nonverbal and verbal behavior on the second track (e.g., request action, laugh, hit, show).

The audio recordings were transcribed after each visit and each transcript detailed the verbal and physical interactions between family members. Participants' verbal exchanges and also behavioral descriptions were included in the data transcription. A list of behavioral codes and examples of transcribed interactions are included in Appendices A and B. For example, a situation when the younger child asks for an object from the older child by saying "can you give me the blue crayon?" would be coded as Request Object Verbally (ROV), and the response of the older child was coded correspondingly as Give (GIV), No response (NOR), or Refuse (REF). To determine the reliability of recorded behaviors, prior to the actual observation, 17-minute and 20-minute observations were conducted respectively for time 1 and time 2 and the percentage of agreement for the coded behaviors was 92% and 86% respectively.

### **Coding**

The coding for the present study was done based on the verbal and nonverbal details included in the transcripts. Some of the existing behavioral codes used in previous research by Ross et al. (1994) were used to provide context and assist in the identification of prosocial behaviors and cue(s) that elicited such behaviors, though not all behavioral codes were relevant

to the present study (see Appendix A), and coders did not rely exclusively on such codes to identify prosociality. For example, although there was a behavioral code for “help”, it was not expected that every instance of “help” would be coded as instrumental helping in the present investigation, nor did we expect instrumental helping to occur only when the “help” code was present.

More specifically, relevant interactions were identified in two ways. First, in some cases, we identified instances in the transcripts where there was at least one cue that would clearly indicate the appropriateness of a prosocial response (e.g., request sharing, crying), regardless of how the sibling responded. In these cases, the type of cue(s) and the sibling’s response to the cue (addressing, rejection, not responding, and not responding due to parental intervention) were coded; if the response was prosocial, the features of the prosocial response were then coded. Second, we also identified instances in the transcripts when there was a clear prosocial behavior. In these cases, the cue(s) that we deemed to have elicited the prosocial behavior was identified, and the features of the prosociality itself were subsequently coded (see Figure 1 at the end of the method section). Table 1 at the end of the method section shows two examples of coded sequences. More specific details of the coding for cues, responses, and features of prosociality are outlined below.

**Behavioral cues.** Prosocial behaviors are evoked by behavioral cue(s) that indicate the needs of others. Cues used in the present study were adapted from previous research on prosociality. For instance, direct verbal requests (e.g., “please give me my teddy”) and indirect verbal requests (e.g., “I want to color the sky blue”) were adapted from Brownell et al. (2009) and Svetlova et al. (2010); non-verbal requests (e.g., pointing) and other observable signs of need (e.g., broken tower) were adapted from Dunfield et al. (2011); negative emotionality (e.g., a sad facial expression) was based on Vaish et al. (2009); and parental intervention (e.g., “give it to Tommy!”) was drawn from Denham et al. (1995). Multiple cues could be coded together in eliciting one response. For a full list of cues and more examples, see Appendix C.

**Responses.** When a cue was identified in the transcripts, the response of the other sibling to that cue was coded into one of four categories: (1) the need was *addressed* by engaging in prosocial behavior (i.e., helping, sharing, comforting, or protecting), (2) the sibling *did not respond* to the need (e.g., the other sibling continues to do what she/he was doing), (3) the sibling *did not respond due to parental intervention*, such that parents responded before the

child, thus precluding their opportunity to respond, and (4) the expression of need was *rejected* by the other sibling (e.g., “No, you can’t wear my T-shirt, it’s for boys”) (for more information, see Appendix D).

**Prosocial behaviors.** When a need was expressed through one or more of the cues and the other sibling addressed it with a type of prosocial behavior, the behavior was coded as (a) instrumental helping, (b) sharing, (c) comforting, or (d) protecting. Only instrumental helping and sharing were coded further for subtypes when they were rejected. In case of rejection of comforting, children were not engaged in any comforting behavior, thus it is impossible to determine what types of comforting they would engage in if they had chosen to comfort. Rejection of protecting was very rare (one instance in 39 situations of protecting), therefore that instance was not coded further for subtypes of protecting. More detailed coding for each subtype of prosociality is described below.

**Instrumental helping.** Instrumental helping referred to actions that were intended to assist others in reaching their instrumental goals, except when those goals were better characterized as fitting into one of the other categories (e.g., if an action could be equally characterized as sharing or instrumental helping, it was coded as the former). Instrumental helping could happen by way of “acting” in which a movement is required to assist others, and also by way of “providing information”, such that information is provided to help others reach their unfulfilled goals (for examples, see Appendix E). It should be noted that any instances of helping that could be beneficial for the helper himself or in service of a shared goal were considered as a joint activity or cooperation and were not coded as instrumental helping. This distinction was made due to the fact that helping instances during cooperation would be beneficial for both the helper and the helpee. Moreover, cooperative behaviors may aim simply to promote social interaction and not necessarily to benefit anyone. For instance, when both siblings are building a tower with Lego blocks, handing a block upon request to the other sibling would not be coded as instrumental helping.

**Sharing.** Sharing referred to actions that compensated for inequality of the distribution of resources. These behaviors were differentiated from instrumental helping in that the object that was shared was either owned or possessed (or both) by the actor. Children’s sharing behavior in this study was coded as costly or noncostly. In costly sharing, children gave up some portion of the resources (further differentiated as some or all), whereas in non-costly sharing children gave

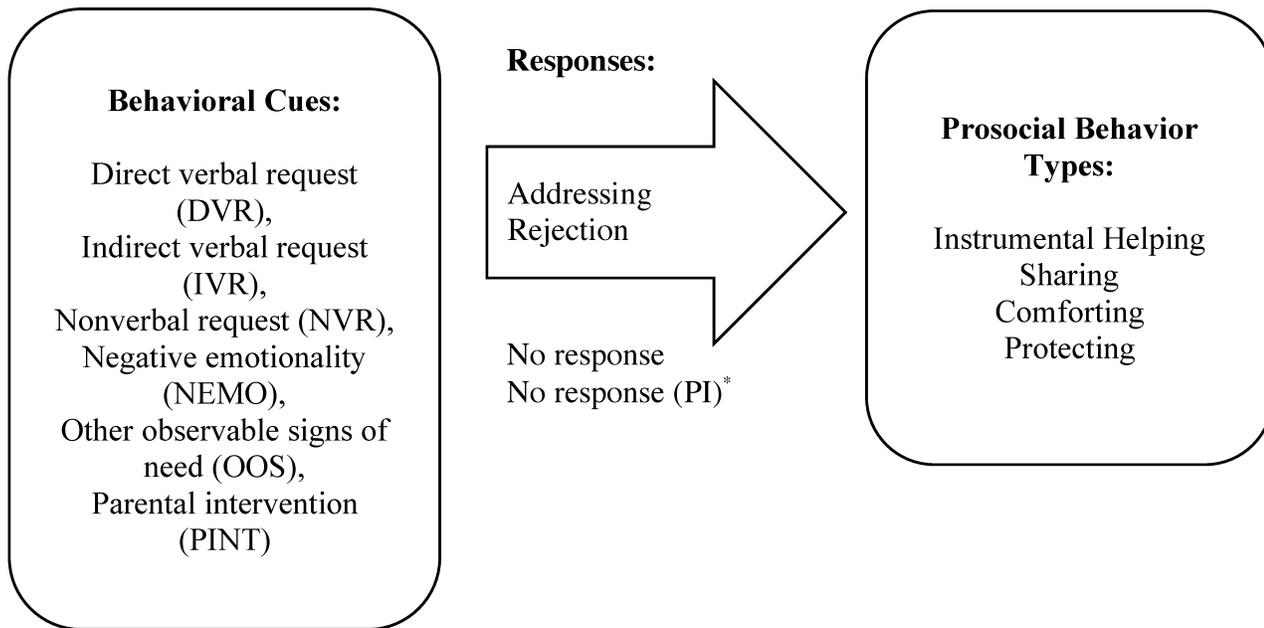
their sibling access to the resources without giving up their own access to them (for examples, see Appendix E). In addition, sharing behavior was further coded for whether the sharer possessed or owned the object. In this case, there were three subtypes: (1) when the sharer possessed and owned the object, (2) when the sharer possessed but did not own the object, and (3) when the sharer possessed an object that nobody owned or for which ownership was unclear. It should be noted that situations in which an object was taken by the recipient (rather than given by a sibling) were not coded as sharing. However, if the action of taking was unsuccessful, it was coded as a nonverbal request for sharing that was rejected (e.g., the younger sibling tries and fails to grab his older sibling's markers). In addition, turn taking instances were typically excluded from the sharing category because in most cases it was a predetermined agreement made before a game between siblings (e.g., giving each child an opportunity to roll the dice in the game). However, there were instances in which turn taking was not associated with an organized game and were thus coded as sharing (e.g., "It's my turn to play with Daddy").

***Comforting.*** Comforting referred to supportive actions that were intended to alleviate others' negative emotional states. Comforting was different from instrumental helping and sharing in the sense that comforting behaviors were emotion-focused rather than being goal-directed. Siblings' comforting behaviors in the present study were further coded as verbal (e.g., "It's ok, you gonna be fine") or nonverbal (e.g., hugging, patting). It should be clarified that instances in which the sibling gave an object to the person in distress (assuming the person's distress did not reflect a goal to gain access to that particular object) were considered nonverbal comforting rather than instrumental helping or sharing as it addressed an emotional rather than a goal-directed need.

***Protecting.*** Protecting referred to proactive actions that were intended to prevent others from being hurt. In protecting situations, the harm had not happened yet, but the protector perceived the need. The type of need in protecting is abstract and the recipient may not be aware of the need. As one example from the data, a sibling prevented her sister from putting her finger in an instrument that might have hurt her. It is important to note that protecting includes prevention from both instances of physical and psychological harm (e.g., older sibling defends younger sibling to prevent her from being punished by a parent).

### **Interrater Reliability**

Interrater reliability for all codes was established based on 20% (N = 32/156) of the files with a naïve research assistant. Coders first discussed the coding process as well as the definitions. Any discrepancies or disagreements were resolved via discussion with the reliability coder. Percent of agreement for identification of relevant sequences was 87%, which was calculated based on line numbers included in sequences (see Table 1), and was computed as  $\text{agreements} / (\text{agreements} + \text{disagreements})$ . Reliability for all subsequent coding was based on Cohen's kappas. Reliability information is reported in Table 2 at the end of the method section.



*Figure 1. Coding Process*

*Note.* \* No response (PI): No response is made due to the fact that parents respond before the child.

**Table 1***Coding Example for Two Sequences*

Line Number	Description of Cue	Child who Provides the Cue	DVR	IVR	NVR	NEMO	OOS	PINT
1507-1510	“can I have a bite of your apple?”	O	1					
83-85	Y fusses; “I can’t put the lid on”	Y		1		1		

Table cont’d (same line numbers)

Response	Description of Response	Child who Responds	Type of Prosociality	Subtype	Second Subtype (only for sharing)	Subtype of Costly sharing
rejected	“no, it’s mine”	Y	sharing	owns	costly	some
addressed	“let me do it”	O	Instrumental helping	acting	-	-

*Note.* Y = Younger Sibling, O = Older Sibling; DVR = Direct verbal request, IVR = Indirect Verbal Request, NVR = Nonverbal Request, NEMO = Negative Emotionality, OOS = Other Observable Signs of Need, PINT = Parental Intervention

**Table 2***Cohen's Kappas for Interrater Reliabilities*

	Cohen's <i>kappa</i>
Direct verbal request	.97
Indirect verbal request	.88
Nonverbal request	.93
Negative emotionality	.98
Other observable signs of need	.90
Parental intervention	.94
Overall responses	.96
Types of prosociality	.95
Subtypes of instrumental helping	.96
Subtypes of sharing (ownership)	.90
Subtypes of sharing (with or without cost)	.90
Subtypes of costly sharing	.88
Subtypes of comforting	1.00
Subtypes of protecting	1.00

## Results

### Plan of Analysis

Data were analyzed based on General Linear Model (GLM)-based techniques; for this purpose, family was treated as the unit of analysis. ANOVA-based procedures were conducted to analyze the unique and interactive effects of time (time point 1, time point 2), and sibling birth order (older sibling, younger sibling) as repeated-measures variables. These factors were used to predict the overall use of each behavioral cue, the overall rates of different responses to the cues, the likelihood of different types of responses in the presence of particular cues (i.e., conditional probabilities), and overall engagement in each type of prosocial behavior. For each significant effect, the Greenhouse-Geisser correction was applied when sphericity assumptions were violated (adjusted *df* are reported below). Furthermore, the Bonferroni correction was applied for post hoc pairwise comparisons. Effect size is reported as partial eta-squared ( $\eta^2$ ).

### Behavioral Cues Indicating Siblings' Needs

**Overall frequencies.** In order to gain an understanding of how the frequencies of different *behavioral cues* varied as a function of birth order and time, a 2 (time: time 1 and time 2) x 2 (sibling recipient of cue: older and younger sibling) x 6 (type of behavioral cue: direct verbal request, indirect verbal request, nonverbal request, negative emotionality, other observable signs of need, parental intervention) repeated measures ANOVA was conducted. A significant main effect was found for the sibling,  $F(1, 38) = 23.09, p < .05, \eta^2 = .37$ . As expected, pairwise comparisons indicated that older siblings ( $M = 21.55, SE = 0.93$ ) received significantly more behavioral cues than younger siblings ( $M = 16.43, SE = 1.12$ ). This suggests that younger siblings provide more cues indicating need; thus, older siblings have more opportunities to respond prosocially to others' needs, as compared to their younger counterparts.

Moreover, the analysis indicated a significant main effect of types of behavioral cue,  $F(3.01, 114.49) = 112.99, p < .05, \eta^2 = .74$ ; descriptive information for the six behavioral cues is presented in Table 3. Pairwise comparisons indicated that direct verbal request and nonverbal request were expressed significantly less than the other four behavioral cues. Parental intervention was expressed significantly more than all other cues.

**Table 3**

*Means and Standard Errors of Behavioral Cues Indicating Need using Frequencies and Proportion Scores*

	<i>M</i> Frequencies ( <i>SE</i> )	<i>M</i> Proportion scores ( <i>SE</i> )
Behavioral Cues		
Direct Verbal Request (DVR)	13.795 (.746)	.122 (.003)
Indirect Verbal Request (IVR)	20.923 (.975)	.184 (.001)
Nonverbal Request (NVR)	15.917 (.814)	.138 (.003)
Negative Emotionality (NEMO)	20.314 (.956)	.180 (.002)
Other Observable Signs of Need (OOS)	20.551 (1.007)	.181 (.002)
Parental Intervention (PINT)	22.417 (1.072)	.196 (.001)
	DVR < all NVR > DVR; NVR < all others; PINT > all	DVR < all NVR > DVR; NVR < all others; PINT > all

*Note.* Means that are in the same column are labeled at the bottom of the table when *post hoc* Bonferroni tests revealed significant differences at  $p < .05$  (e.g., DVR “<” is significantly less than all behavioral cues). Means and standard errors of proportional scores are calculated as frequency of each cue over the sum of the frequencies of all cues.

Furthermore, the analysis revealed a significant interaction of time by types of behavioral cues,  $F(2.51, 95.39) = 4.25, p < .05, \eta^2 = .10$ . As expected, pairwise comparisons indicated that direct verbal requests were expressed significantly more at time 2 ( $M = 15.37, SE = 1.07$ ) than at time 1 ( $M = 12.21, SE = .92$ ). No significant effects of time were found for the other types of behavioral cues.

Moreover, the analysis revealed a significant interaction of sibling by types of behavioral cues,  $F(2.27, 86.52) = 9.97, p < .05, \eta^2 = .20$ . Consistent with the hypotheses, additional *post hoc* comparisons indicated that older siblings received most types of behavioral cues

significantly more than younger siblings. Put another way, younger siblings provided most types of behavioral cues more than their older counterparts. The exception was that negative emotionality was provided equally by both children; descriptive information for the sibling by types of behavioral cue interaction is presented in Table 4.

**Proportional scores.** To gain a better understanding of how much older and younger siblings expressed each cue relative to the other cues, proportional scores were computed for each cue (i.e., older sibling's frequency of receiving DVR at time 1 / older sibling's frequency of receiving DVR + IVR + NVR + NEMO + OOS + PINT at time 1). A 2 (time: time 1 and time 2) x 2 (sibling recipient of cue: older and younger sibling) x 6 (type of behavioural cue: direct verbal request, indirect verbal request, nonverbal request, negative emotionality, other observable signs of need, parental intervention) repeated measures ANOVA was conducted with proportion scores.

The analysis revealed a significant effect of types of behavioural cue,  $F(2.86, 108.97) = 167.89, p < .05, \eta^2 = .81$ ; descriptive information for proportionate use of the six behavioral cues is presented in Table 3. Similar to the analysis with frequencies, pairwise comparisons indicated that direct verbal request was expressed significantly less than all other cues. Parental intervention was the most frequently expressed cue.

Furthermore, the analysis revealed a significant interaction of time by type of behavioral cue,  $F(2.85, 108.48) = 5.32, p < .05, \eta^2 = .12$ . As expected, there were proportionately more direct verbal requests at time 2 ( $M = .131, SE = .004$ ) than at time 1 ( $M = .112, SE = .005$ ). Consistent with hypotheses, siblings expressed their needs through negative emotionality proportionately more at time 1 ( $M = .185, SE = .003$ ) than at time 2 ( $M = .176, SE = .002$ ). In addition, there were proportionately more nonverbal requests at time 1 ( $M = .145, SE = .004$ ) than at time 2 ( $M = .131, SE = .004$ ).

Moreover, the analysis revealed a significant interaction of sibling by type of behavioral cue,  $F(3.09, 117.56) = 21.93, p < .05, \eta^2 = .36$ . Inconsistent with our expectation, further analyses indicated that older siblings were proportionately more likely than younger siblings to receive direct verbal requests (DVR) and younger siblings were proportionately more likely than older siblings to receive negative emotionality (NEMO) as a cue. Additionally, as we expected, older siblings were proportionately more likely than younger siblings to receive nonverbal

**Table 4***Means and Standard Errors of Older and Younger Siblings' Types of Behavioral Cues using Frequencies and Proportion Scores*

	Older Sibling Recipient of Cue		Younger Sibling Recipient of Cue	
	<i>M</i> Frequencies per time point ( <i>SE</i> )	<i>M</i> Proportion scores ( <i>SE</i> )	<i>M</i> Frequencies per time point ( <i>SE</i> )	<i>M</i> Proportion scores ( <i>SE</i> )
Direct Verbal Request (DVR)	17.462 <sup>a</sup> (.962)	.136 <sup>f</sup> (.004)	10.128 <sup>a</sup> (.732)	.107 <sup>f</sup> (.004)
Indirect Verbal Request (IVR)	23.821 <sup>b</sup> (1.041)	.185 (.002)	18.026 <sup>b</sup> (1.261)	.183 (.002)
Nonverbal Request (NVR)	18.718 <sup>c</sup> (1.006)	.144 <sup>g</sup> (.003)	13.115 <sup>c</sup> (.969)	.132 <sup>g</sup> (.004)
Negative Emotionality (NEMO)	21.231 (.948)	.164 <sup>h</sup> (.003)	19.397 (1.328)	.197 <sup>h</sup> (.002)
Other Observable Signs of Need (OOS)	22.718 <sup>d</sup> (1.025)	.177 (.003)	18.385 <sup>d</sup> (1.319)	.184 (.003)
Parental Intervention (PINT)	25.308 <sup>e</sup> (1.141)	.194 (.001)	19.410 <sup>e</sup> (1.389)	.197 (.001)

*Note.* Means that are in the different columns are labeled with the same superscripts when *post hoc* Bonferroni tests revealed significant differences at  $p < .05$  (e.g., “a” is significantly different from “a”; comparing the two siblings on the frequency of expressing each behavioral cue). Please note, in this table older sibling and younger siblings were the recipients of the behavioral cues.

request (NVR). Descriptive information of the proportional scores of the siblings by types of behavioral cue interaction is presented in Table 4.

**Birth order effects.** In order to examine the differences in expressing behavioral cues of need between firstborn siblings at age 4 and secondborn siblings at the same age, a 2 (birth order: firstborn 4-year-olds, secondborn 4-year-olds) x 6 (types of behavioral cue: direct verbal request, indirect verbal request, nonverbal request, negative emotionality, other observable signs of need, parental intervention) repeated measure ANOVA was conducted with frequencies. The analysis revealed a significant interaction effect of birth order by behavioral cues,  $F(2.33, 88.55) = 5.09$ ,  $p < .05$ ,  $\eta^2 = .11$ . Pairwise comparisons indicated that 4-year-old firstborns received direct verbal requests ( $M = 14.97$ ,  $SE = 1.16$ ) and nonverbal requests ( $M = 18.79$ ,  $SE = 1.30$ ) significantly more than 4-year-old secondborns ( $M_s = 10.79, 12.38$ ,  $SE_s = .97, 1.10$ , respectively).

### **Different Responses to Siblings' Manifestations of Need**

**Overall frequencies.** Overall, siblings had 3711 opportunities to be prosocial. Summing across both siblings, children in each family had an average of 16 opportunities per hour to be prosocial (i.e.,  $3711 / 39$  families = 95.15, divided by 6 hours of observation per family = 15.9). Out of these opportunities, siblings engaged in prosociality 40% of the time (1474 times; or 6.3 prosocial behaviors per hour), whereas they rejected being prosocial 41% of the time (1528 times; or 6.5 rejections per hour). In the remaining 19% of the situations, they were unresponsive. In order to examine the frequencies of each response as a function of time and birth order, a 2 (time: time 1 and time 2) x 2 (sibling: older and younger sibling) x 4 (response: address, reject, no response, no response due to parental intervention) repeated measures ANOVA was conducted.

The results revealed a significant effect of sibling,  $F(1, 38) = 23.41$ ,  $p < .05$ ,  $\eta^2 = .38$ . Pairwise comparisons indicated that younger siblings ( $M = 5.10$ ,  $SE = .35$ ) responded to the other's behavioral cues significantly less than older siblings ( $M = 6.71$ ,  $SE = .29$ ). These findings are consistent with the aforementioned results concerning the relative frequencies of receiving behavioral cues by older and younger siblings; that is, younger siblings received significantly fewer behavioral cues than older siblings. As a consequence, it was deemed important to also examine the proportional likelihood of each response after accounting for the total number of opportunities to be prosocial (see results below for *proportion scores*).

Moreover, the results revealed a significant effect of response,  $F(2.38, 90.76) = 160.69$ ,

$p < .05$ ,  $\eta^2 = .81$ . Further analyses indicated that siblings used addressing and rejection equally frequently ( $M_s = 9.38, 9.71, SE = .51, .56$ , respectively); all other pairwise comparisons were significant, such that not responding was significantly less frequent than addressing and rejection ( $M = 3.64, SE = .26$ ), followed by not responding due to parental intervention ( $M = .90, SE = .10$ ).

Furthermore, the analysis revealed a significant interaction of time by response,  $F(2.09, 79.63) = 3.14, p < .05, \eta^2 = .07$ . Consistent with the hypothesis, at time 1, there were significantly more failures to respond due to parental intervention, as well as significantly more rejections ( $M_s = 1.10, 10.73$ , respectively) than at time 2 ( $M_s = .70, 8.69$ , respectively), whereas the frequencies of addressing and not responding were not significantly different across time points (see Figure 2).

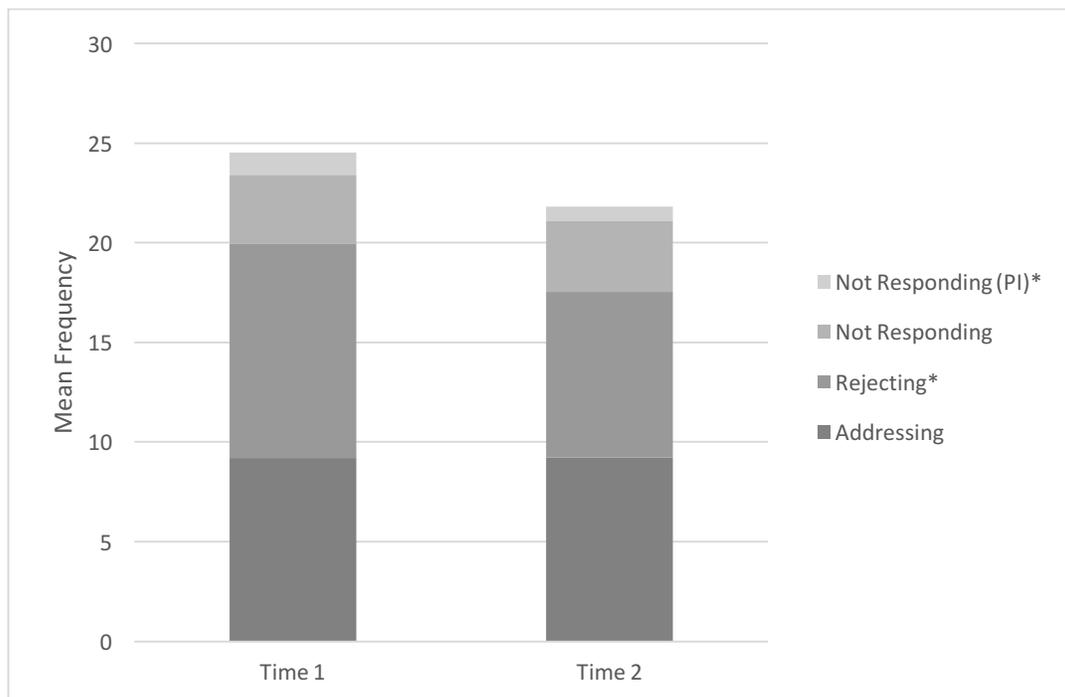


Figure 2. *Frequency of Responses to the Expression of Need at Time 1 and Time 2*

*Note.* Significant differences between time 1 and time 2 at  $p < .05$  are labeled with an asterisk in the legend.

**Proportion scores.** In order to gain a more complete understanding of siblings' responses, proportion scores were calculated by considering the frequencies of each response divided by the total of responses (i.e., expressed as a proportion of their number of opportunities

to be prosocial). A 2 (time: time 1 and time 2) x 2 (sibling: older and younger sibling) x 4 (response: address, reject, no response, no response due to parental intervention) repeated measures ANOVA was conducted.

The analysis revealed a significant effect of response,  $F(2.23, 84.72) = 265.21, p < .05, \eta^2 = .87$ . Pairwise comparisons indicated that siblings were most likely to address and reject opportunities to be prosocial (both  $M_s = .40, SE = .01$ ), followed by failure to respond ( $M = .15, SE = .01$ ); they were unlikely to fail to respond because of parental intervention ( $M = .03, SE = .01$ ).

Additionally, the analysis indicated a significant interaction of time by response,  $F(1.47, 56.06) = 8.52, p < .05, \eta^2 = .18$ . As expected, there was proportionately more addressing at time 2 ( $M = .44, SE = .01$ ) than at time 1 ( $M = .36, SE = .01$ ). By contrast, at time 1, children were proportionately more likely to fail to respond due to parental intervention and to reject opportunities to be prosocial ( $M_s = .05, .44, SE_s = .01, .01$ , respectively) as compared to time 2 ( $M_s = .03, .37, SE_s = .01, .01$ , respectively). The proportional likelihood of not responding was not significantly different at time 1 and time 2.

Finally, the analysis revealed a significant interaction of sibling by response,  $F(1.69, 64.35) = 3.47, p < .05, \eta^2 = .08$ . Consistent with expectations, pairwise comparisons indicated that younger siblings ( $M = .36, SE = .01$ ) addressed needs proportionately less than older siblings ( $M = .44, SE = .02$ ). In addition, younger siblings failed to respond due to parental intervention ( $M = .05, SE = .01$ ) significantly more than older siblings ( $M = .03, SE = .01$ ). No significant differences between siblings were found for rejection or no response.

**Birth order effects.** Moreover, in order to test how firstborn siblings at age 4 responded to the manifestation of need compared to secondborn siblings at the same age, a 2 (birth order: first born 4-year-olds, second born 4-year-olds) x 4 (response: addressing, not responding, not responding due to parental intervention, rejection) repeated measure ANOVA was conducted with frequencies. No significant interaction was found for birth order by type of response.

### **Variations in Responses to Different Behavioral Cues of Need**

To test the research question regarding whether there was an association between types of behavioral cues and siblings' responses to distinct manifestations of need, a 2 (time: time 1 and time 2) x 2 (sibling recipient of cue: older and younger sibling) x 4 (response: address, reject, no response, no response due to parental intervention) x 6 (types of behavioral cue: direct verbal

request, indirect verbal request, nonverbal request, negative emotionality, other observable signs of need, parental intervention) repeated measures ANOVA was conducted. For easier interpretability of the interaction effect of most interest (i.e., cue x response), the data were expressed as proportions, such that each response to a given cue was divided by the total number of instances of that cue (e.g., addressing Direct Verbal Requests/ all Direct Verbal Requests).

A significant interaction between types of behavioral cues and responses was observed,  $F(5.60, 179.48) = 28.18, p < .05, \eta^2 = .47$ . Descriptive statistics are presented in Table 5. The results of pairwise comparisons are reported separately for each response below. It should be noted that other significant main effects that were found in this analysis (e.g., a significant main effect for response) are not reported here, since they are redundant to analyses reported above. For this reason, only the results of the interaction between response and cue are presented below.

**Addressing.** Pairwise comparisons indicated that direct verbal request was addressed by siblings significantly less than nonverbal request and negative emotionality; indirect verbal request was addressed by siblings significantly less than nonverbal request and more than other observable signs of need and parental intervention; nonverbal request was addressed by siblings significantly more than all other behavioral cues; negative emotionality was addressed by siblings significantly more than other observable signs of need and parental intervention; and parental intervention was addressed significantly more than other observable signs of need. In sum, the most frequently addressed cues included nonverbal request and negative emotionality. The least frequently addressed cues were other observable signs of need and direct verbal request.

**Rejection.** Contrary to the hypothesis, pairwise comparisons indicated that direct verbal request was rejected significantly more than all other cues. Nonverbal request was rejected significantly less than all other cues. Negative emotionality was rejected significantly more than all other cues, except other observable signs of need. In sum, the most frequently rejected cue was direct verbal request, and the least frequently rejected cue was nonverbal request.

**Not responding.** Siblings were unresponsive to direct verbal request significantly less than all other cues. Moreover, they were most often unresponsive to nonverbal request, followed by other observable signs of need and then parental intervention (significantly more than the other three cues).

**Table 5***Means and Standard Errors of Children's Responses in the Presence of Different Types of Behavioral Cues using Proportion Scores*

	Addressing <i>M (SE)</i>	Rejecting <i>M (SE)</i>	No Response <i>M (SE)</i>	No Response (Parental Intervention) <i>M (SE)</i>
Direct Verbal Request (DVR)	.377 (.012)	.496 (.013)	.090 (.008)	.037 (.005)
Indirect Verbal Request (IVR)	.404 (.013)	.407 (.014)	.150 (.010)	.039 (.006)
Nonverbal Request (NVR)	.455 (.015)	.286 (.012)	.207 (.012)	.051 (.008)
Negative Emotionality (NEMO)	.419 (.012)	.434 (.012)	.131 (.008)	.016 (.005)
Other Observable Signs of Need (OOS)	.358 (.013)	.424 (.013)	.175 (.011)	.043 (.006)
Parental Intervention (PINT)	.387 (.012)	.413 (.013)	.161 (.009)	.040 (.006)
	NVR> all NEMO> DVR OOS< all, except DVR PINT< all, except DVR; PINT> OOS	DVR> all NVR< all NEMO> IVR, NVR, & PINT	DVR< all NVR> all OOS< NVR; OOS> all others; PINT>NEMO, IVR	NVR> all, except OOS NEMO< all

*Note.* e.g., DVR “>” is significantly more than all behavioral cues, comparing children’s responses to different types of behavioral cues. Means and standard errors are based on the proportion scores of responding to each cue divided by the total frequency of responses to that cue.

**Not responding due to parental intervention.** Parental intervention impeded children's responses particularly often following nonverbal request; this probability was significantly higher than that for all cues except other observable signs of need. By contrast, parental intervention was least likely to precipitate children's failures to respond following negative emotionality cues; this probability was significantly lower than all other cues.

To summarize, siblings addressed nonverbal request and negative emotionality significantly more than all other behavioral cues. Inconsistent with the hypothesis, direct verbal request was rejected significantly more than all other cues. On the other hand, nonverbal request was rejected significantly less than any other cue. Collectively summarizing the results of rejection and no response, when the behavioral cue was nonverbal request, it was more likely that children would fail to respond to the cue rather than reject it. However, when children requested something directly, it was more likely that their sibling would respond directly via rejection than by not responding to it at all. In addition, when children expressed their need through negative emotions, it was less common for parents' intervention to preclude a response. However, when children exhibited their need nonverbally, it was more likely that their sibling did not respond as a result of parents' intervention.

Moreover, a significant three-way interaction between types of behavioral cues, responses, and sibling was observed,  $F(4.20, 155.64) = 3.73, p < .05, \eta^2 = .09$ . Descriptive statistics are provided at Table 6. As expected, pairwise comparisons indicated that older siblings addressed indirect verbal requests, other observable signs of need and parental intervention significantly more than younger siblings. No significant difference was found between older and younger siblings' rejection responses to different behavioral cues. In addition, older siblings were significantly less likely to be unresponsive to direct verbal request than younger siblings. Moreover, older siblings were significantly less likely to be unresponsive due to parental intervention to all behavioral cues, except for negative emotionality.

### **Prosocial Behaviors Types**

In contrast to instances when children failed to respond to cues, when cues were addressed or explicitly rejected, the consequent types of prosociality (or lack thereof) were coded in more detail. Therefore, in this section, only the results of addressing and rejection responses are presented, whereas failures to respond were omitted from analyses. In order to gain an understanding of the extent to which siblings addressed and rejected opportunities to engage in

**Table 6**

*Means and Standard Errors of each Sibling's Responses in the Presence of Different Types of Behavioral Cues using Proportion Scores*

	Older sibling <i>M (SE)</i>	Younger sibling <i>M (SE)</i>
<b>Addressing</b>		
Direct Verbal Request	.397 (.023)	.357 (.018)
Indirect Verbal Request	.436 <sup>a</sup> (.022)	.371 <sup>a</sup> (.017)
Nonverbal Request	.478 (.024)	.433 (.022)
Negative Emotionality	.438 (.019)	.400 (.018)
Other Observable Signs of Need	.404 <sup>b</sup> (.019)	.312 <sup>b</sup> (.019)
Parental Intervention	.420 <sup>c</sup> (.019)	.354 <sup>c</sup> (.017)
<b>Rejecting</b>		
Direct Verbal Request	.521 (.025)	.472 (.019)
Indirect Verbal Request	.397 (.021)	.416 (.018)
Nonverbal Request	.280 (.017)	.291 (.020)
Negative Emotionality	.412 (.019)	.456 (.018)
Other Observable Signs of Need	.406 (.021)	.443 (.017)
Parental Intervention	.401 (.019)	.424 (.018)
<b>No response</b>		
Direct Verbal Request	.064 <sup>d</sup> (.011)	.116 <sup>d</sup> (.011)
Indirect Verbal Request	.139 (.014)	.162 (.012)
Nonverbal Request	.201 (.019)	.213 (.016)
Negative Emotionality	.130 (.012)	.132 (.011)
Other Observable Signs of Need	.159 (.016)	.190 (.013)
Parental Intervention	.149 (.014)	.172 (.012)
<b>No response (Parental intervention)</b>		
Direct Verbal Request	.018 <sup>e</sup> (.005)	.056 <sup>e</sup> (.007)
Indirect Verbal Request	.028 <sup>f</sup> (.008)	.050 <sup>f</sup> (.007)
Nonverbal Request	.040 <sup>g</sup> (.010)	.063 <sup>g</sup> (.008)
Negative Emotionality	.020 (.009)	.011 (.003)
Other Observable Signs of Need	.031 <sup>h</sup> (.009)	.055 <sup>h</sup> (.007)
Parental Intervention	.030 <sup>i</sup> (.008)	.050 <sup>i</sup> (.006)

*Note.* Means that are in the different columns are labeled with the same superscripts when *post hoc* Bonferroni tests revealed significant differences at  $p < .05$  (e.g., “a” is significantly different from “a”).

each type of prosociality, we conducted a series of 2 (time: time 1 and time 2) x 2 (sibling: older and younger sibling) x 4 (prosociality types: comforting, instrumental helping, protecting, sharing) repeated measures ANOVAs, with the frequencies of the prosocial responses as dependent variables, and analyses conducted separately for addressing and rejection.

**Addressing.** The analysis revealed a significant main effect of prosociality types,  $F(1.89, 71.83) = 111.265, p < .05, \eta^2 = .74$ . Follow-up *post hoc* revealed that instrumental helping and sharing were both addressed significantly more than comforting and protecting (see Figure 3).

Moreover, a significant interaction effect between time and sibling was found,  $F(1, 38) = 3.37, p < .05, \eta^2 = .08$ . Pairwise comparisons showed that at time 1 older siblings addressed their younger siblings' needs ( $M = 2.57, SE = .27$ ) significantly more than younger siblings addressed the needs of their older counterparts ( $M = 1.97, SE = .21$ ). However, at time 2 younger siblings addressed their siblings' needs ( $M = 2.48, SE = .28$ ) to the same extent as older siblings did ( $M = 2.35, SE = .17$ ).

**Rejection.** A significant main effect of type of prosociality was found for rejection,  $F(1.13, 43.17) = 251.23, p < .05, \eta^2 = .87$ . Pairwise comparisons revealed that all four types of prosociality were rejected significantly differently from one another; rejection was most likely for sharing, followed by instrumental helping, then comforting, and finally protecting (see Figure 3).

Moreover, a significant interaction effect of time by type of prosociality was found,  $F(1.24, 47.11) = 4.95, p < .05, \eta^2 = .11$ . There was a significant simple effect of time only for sharing but not for the other types of prosociality. As expected, there was significantly more rejection of sharing at Time 1 ( $M = 9.16, SE = .73$ ) than at Time 2 ( $M = 7.14, SE = .55$ ).

Additionally, a significant interaction effect of sibling by type was revealed,  $F(1.26, 48.06) = 10.64, p < .05, \eta^2 = .21$ . Inconsistent with our expectation, pairwise comparisons indicated that older siblings rejected sharing and comforting ( $M_s = 9.34, .77, SE = .57, .14$ , respectively) significantly more than younger siblings ( $M_s = 6.96, .06, SE = .58, .02$ , respectively), whereas older and younger siblings rejected helping and protecting to the same extent.

**Addressing relative to rejecting prosociality types.** In order to more directly examine how much children addressed rather than rejected different types of prosocial behaviors, an

additional analysis was conducted using the proportion of addressing relative to the total of (addressing + rejection). This analysis was limited to helping and sharing, due to the infrequent occurrences of comforting and protecting. A 2 (time: time 1 and time 2) x 2 (sibling: older and younger sibling) x 2 (type: instrumental helping, sharing) repeated measure ANOVA revealed a significant effect of types of prosocial behavior,  $F(1, 32) = 196.35, p < .05, \eta^2 = .86$ . As expected, siblings were proportionately more likely to address than reject instrumental helping ( $M = .78, SE = .02$ ) as compared to sharing ( $M = .34, SE = .01$ ).

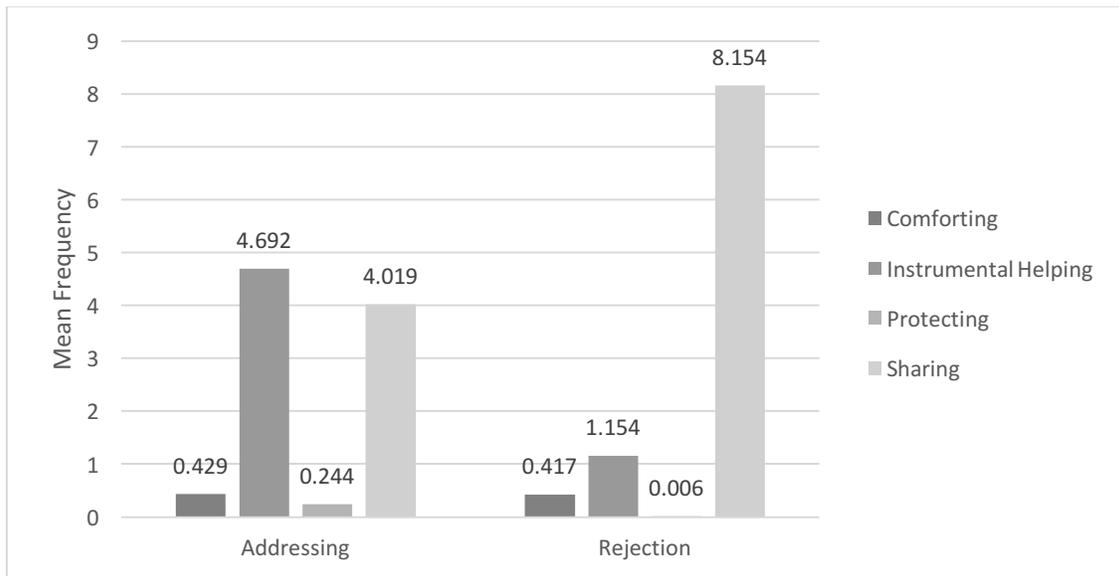


Figure 3. *Patterns of Addressing and Rejection Responses to Different Prosociality Types*

*Note.* Children were equally likely to address cues eliciting instrumental helping and sharing, and these forms of prosociality were significantly more frequent than comforting and protecting ( $ps < .05$ , the difference between comforting and protecting is not significant). However, the pattern for rejecting indicated that rejections were most likely for sharing, followed by instrumental helping, then comforting, and finally protecting (all  $ps < .05$ ).

**Birth order effects for addressing prosocial behavior types.** In order to examine how firstborn siblings at age 4 engaged in different prosocial behavior types compared to secondborn siblings at the same age, a 2 (birth order: 4-year-old firstborns, 4-year-old secondborns) x 4 (type of prosociality: comforting, instrumental helping, protecting, sharing) repeated measure ANOVA was conducted with frequencies. The analysis revealed a significant interaction of birth order by

types of prosociality for addressing,  $F(2.03, 77.44) = 3.97, p < .05, \eta^2 = .09$ . Specifically, 4-year-old firstborns ( $M = .48, SE = .12$ ) comforted significantly more than 4-year-old secondborns ( $M = .13, SE = .06$ ). In addition, 4-year-old firstborns ( $M = 5.00, SE = .59$ ) helped significantly more than 4-year-old secondborns ( $M = 3.25, SE = .41$ ). No significant birth order effects were found for engaging in protecting or sharing.

**Birth order effects for rejecting prosocial behavior types.** Furthermore, in order to examine the extent to which firstborn siblings at age 4 rejected opportunities to engage in different prosocial behavior types compared to secondborn siblings at the same age, a 2 (birth order: 4-year-old firstborns, 4-year-old secondborns) x 4 (type of prosociality: comforting, instrumental helping, protecting, sharing) repeated measure ANOVA was conducted. No significant interaction was found for birth order by rejection of the different types of prosociality.

### **Siblings' Prosocial Behaviors in the Presence of Different Types of Behavioral Cues**

To test the research question regarding whether there was an association between types of behavioral cues and siblings' engagement (i.e., addressing response) in different types of prosocial behaviors, a 2 (time: time 1 and time 2) x 2 (sibling: older and younger siblings) x 6 (types of behavioral cue: direct verbal request, indirect verbal request, nonverbal request, negative emotionality, other observable signs of need, parental intervention) x 4 (types of prosociality: instrumental helping, sharing, comforting, protecting) repeated measures ANOVA was conducted. The analysis was initially aimed to be conducted with proportional scores (i.e., Direct Verbal Request eliciting instrumental helping/all instances of instrumental helping that were addressed) in order to make the interpretability of the interaction effect of most interest (i.e., cue x types of prosociality) easier. However, given the complexity of the analysis and the low frequencies in some cells, proportionalizing the data resulted in a substantial loss of *df*. Therefore, in this section, only the results of frequencies are reported.

Several significant main effects, two-way and three-way interactions were found. However, only the results of the interaction between behavioral cues and types of prosociality, as well as three-way interactions between (a) time, behavioral cues, and types of prosociality and (b) sibling, behavioural cues, and types of prosociality are presented below. Other significant main effects that were found in this analysis (e.g., a significant main effect for behavioral cues) are not reported here, since they are redundant to analyses reported above. The four-way interaction was not significant.

A significant interaction between types of behavioral cues and types of prosociality was observed,  $F(3.59, 136.75) = 56.03, p < .05, \eta^2 = .59$ . Descriptive statistics are presented in Table 7. Pairwise comparisons indicated that the behavioral cues of direct verbal requests and other observable signs of need elicited instrumental helping more than any other behavioral cues (i.e., the difference between DVR and OOS was not significant). On the other hand, and inconsistent with our expectation, parental intervention was least likely to elicit instrumental helping. With regard to sharing and consistent with the hypotheses, nonverbal request and direct verbal request prompted sharing significantly more than other behavioral cues (the difference between NVR and DVR was not significant). Negative emotionality was least likely to elicit sharing. As expected, it was most likely that siblings comforted each other when the cue was negative emotionality. However, comforting was never elicited by the cue of nonverbal request. Finally, similar to what expected siblings were most likely to protect one another when the cue was other observable signs of need, whereas parental intervention never prompted protecting.

In addition, a significant three-way interaction between time, behavioral cues, and types of prosociality was found,  $F(3.99, 151.61) = 4.11, p < .05, \eta^2 = .09$ . Further analysis revealed that direct verbal request prompted instrumental helping significantly more at Time 2 ( $M = 3.70, SE = .40$ ) than at Time 1 ( $M = 2.25, SE = .31$ ). In addition, negative emotionality led to instrumental helping, sharing and comforting significantly more at Time 1 ( $M = .41, .33, .38, SE = .08, .08, .08$ , respectively) than at Time 2 ( $M = .15, .11, .21, SE = .05, .04, .05$ , respectively). Furthermore, parental intervention elicited sharing significantly more at Time 1 ( $M = .65, SE = .12$ ) than at Time 2 ( $M = .34, SE = .08$ ).

Moreover, a significant three-way interaction between sibling, behavioral cues, and types of prosociality was found,  $F(4.08, 155.25) = 4.07, p < .05, \eta^2 = .09$ . Pairwise comparisons revealed that younger siblings ( $M = 1.57, SE = .17$ ) were significantly more likely to share upon receiving direct verbal request than older siblings ( $M = 1.06, SE = .12$ ). Additionally, younger siblings ( $M = 2.30, SE = .29$ ) were significantly more likely to share upon receiving nonverbal request than older siblings ( $M = 1.38, SE = .21$ ). However, negative emotionality prompted older siblings ( $M = .51, .41, .46, SE = .12, .08, .08$ , respectively) significantly more than younger siblings ( $M = .05, .03, .14, SE = .02, .02, .05$ , respectively) to help, share and comfort. Further, other observable signs of need prompted older siblings ( $M = 1.32, .96, .28, SE = .20, .14, .05$ ,

**Table 7**

*Means and Standard Errors of Siblings' Prosocial Behaviors in the Presence of Different Types of Behavioral Cues using Frequency Scores*

	Instrumental helping	Sharing	Comforting	Protecting
	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>
Direct Verbal Request (DVR)	2.981 (.252)	1.321 (.122)	.019 (.011)	.006 (.006)
Indirect Verbal Request (IVR)	.519 (.066)	.468 (.066)	.058 (.025)	.019 (.019)
Nonverbal Request (NVR)	.391 (.056)	1.846 (.212)	.000 (.000)	.006 (.006)
Negative Emotionality (NEMO)	.288 (.059)	.224 (.049)	.301 (.054)	.026 (.015)
Other Observable Signs of Need (OOS)	.942 (.116)	.776 (.105)	.077 (.031)	.199 (.057)
Parental Intervention (PINT)	.128 (.032)	.500 (.089)	.051 (.021)	.000 (.000)
	(DVR = OOS) > all PINT < all, except NEMO	(DVR = NVR) > all NEMO < all OOS > PINT	NEMO > all	OOS > all, except NEMO

*Note.* Means that are in the same column are labeled at the bottom of the table when *post hoc* Bonferroni tests revealed significant differences at  $p < .05$  (e.g., DVR “>” is significantly more than all behavioral cues).

respectively) significantly more than younger siblings ( $M = .56, .59, .11, SE = .13, .11, .05$ , respectively) to help, share, and protect. Parental intervention prompted older siblings to help and to share ( $M = .19, .64, SE = .05, .12$ , respectively) significantly more than younger siblings ( $M = .06, .36, SE = .02, .07$ , respectively).

### **Subtypes of Different Forms of Prosocial Behavior**

In order to examine how frequently siblings engaged in (i.e., addressed) different subtypes of prosocial behaviors, additional analyses were conducted. Information concerning different subtypes of each prosocial behavior is presented below.

**Instrumental helping.** To test the frequencies of engaging in each subtype of instrumental helping, a 2 (time: time 1 and time 2) x 2 (sibling: older and younger sibling) x 2 (type of instrumental helping: doing an action, providing information) repeated measures ANOVA was conducted (for descriptive information, see Table 8 at the end of this section). The analysis revealed a significant main effect of subtype,  $F(1, 38) = 43.15, p < .05, \eta^2 = .53$ . A pairwise comparison indicated that siblings helped instrumentally by doing an action significantly more than by providing information. However, it is important to note that these findings should also be contextualized against how much these subtypes were rejected by siblings (further analysis is provided in *addressing relative to rejecting prosocial behavior subtypes* section). This effect was not qualified by time or sibling.

**Sharing.** To test the frequencies of engaging in each subtype of sharing, we conducted a two sets of analyses, first examining variations in sharing when the behavior incurred different costs, and subsequently examining sharing under different ownership vs. possession conditions. Descriptive information is presented in Table 8.

**Costly and non-costly sharing.** A 2 (time: time 1 and time 2) x 2 (sibling: older and younger sibling) x 3 (type of sharing with costs: costly-all, costly-some, non-costly) repeated measures ANOVA revealed a significant main effect of costly and noncostly sharing subtypes,  $F(1.26, 48.14) = 100.02, p < .05, \eta^2 = .72$ . Further analysis indicated that children were significantly more likely to share when they gave up all the resources, followed by when they gave up some of the resources; siblings shared least frequently by giving access to the resources without relinquishing access. However, it is important to note that these findings should also be contextualized against how much these subtypes were rejected by siblings (further analysis is

provided in *addressing relative to rejecting prosocial behavior subtypes* section). This effect was not moderated by time or sibling.

**Ownership vs. possession sharing.** A 2 (time: time 1 and time 2) x 2 (sibling: older and younger sibling) x 3 (type of sharing ownership vs. possession: possesses and owns, possesses but no one owns, possesses but not owns) repeated measures ANOVA revealed a significant effect of ownership vs. possession sharing subtypes,  $F(1.37, 52.15) = 34.82, p < .05, \eta^2 = .47$ . Pairwise comparisons revealed that siblings shared significantly more when they possessed an object that no one owned than when they did not own the object or when they owned it. The difference between sharing an object owned or not owned by the child was not significant. However, again, it was deemed important to contextualize these findings against how much these subtypes were rejected by siblings (further analysis is provided in *addressing relative to rejecting prosocial behavior subtypes*' section). This effect was not moderated by time or sibling.

**Comforting.** To gain an understanding of the frequencies of engaging in subtypes of comforting, a 2 (time: time 1 and time 2) x 2 (sibling: older and younger sibling) x 2 (type of comforting: verbal, non-verbal) repeated measures ANOVA was conducted (for descriptive information, see Table 8). The analysis failed to reveal any significant effects involving subtypes; this suggests that children did not utilize verbal and non-verbal comforting significantly differently.

**Protecting.** In order to investigate the frequencies of engaging in subtypes of protecting, a 2 (time: time 1 and time 2) x 2 (sibling: older and younger sibling) x 2 (types of protection: physical, psychological) repeated measures ANOVA was conducted. The analysis revealed a significant main effect of subtypes,  $F(1, 38) = 10.32, p < .05, \eta^2 = .21$  (for descriptive information, see Table 8). As expected, children protected their siblings significantly more from physical harms than psychological harms. This effect was not moderated by time or sibling.

**Addressing relative to rejecting subtypes of prosociality.** In order to further examine how much children addressed each subtype of instrumental helping and sharing relative to rejecting them, additional analysis was conducted using the proportional scores. These analyses were limited to helping and sharing behaviors, due to the fact that instances of rejection of comforting and protecting were not coded for subtypes (see Method section). Furthermore, since

the frequencies of rejection were low (particularly for instrumental helping), the data were collapsed over time.

***Addressing relative to rejecting instrumental helping by doing an action and by providing information.*** To gain an understanding of how much siblings addressed each subtype of instrumental helping relative to rejecting it, a 2 (sibling: older and younger sibling) x 2 (response: addressing and rejection) x 2 (type: doing an action, providing information) repeated measures ANOVA was conducted. The data were collapsed over time and expressed as proportions, such that the frequency for addressing each type of instrumental helping was divided by the total number of times in which instrumental helping was addressed (e.g., addressing by doing an action/ addressing by doing an action and providing information).

The analysis revealed a significant main effect of subtypes,  $F(1, 20) = 158.36, p < .05, \eta^2 = .88$ . Pairwise comparison indicated that children had proportionately more opportunities to help instrumentally by doing an action ( $M = .81, SE = .02$ ) than by providing information ( $M = .18, SE = .02$ ). Moreover, the analysis revealed a significant interaction effect of responses by subtypes,  $F(1, 20) = 39.48, p < .05, \eta^2 = .66$ . Consistent with the expectations, further analysis indicated that siblings were significantly more likely to reject ( $M = .94, SE = .03$ ) helping than to address it ( $M = .69, SE = .03$ ), when helping required doing an action. In addition, siblings were significantly more likely to engage in helping ( $M = .31, SE = .03$ ) than to reject it ( $M = .05, SE = .03$ ), when helping was by providing information.

***Addressing relative to rejecting costly and noncostly sharing.*** In order to examine how much siblings addressed costly and noncostly sharing relative to rejecting them, a series of 2 (sibling: older and younger sibling) x 2 (response: addressing and rejection) x 3 (type: costly-all, costly-some, noncostly) repeated measures ANOVA were conducted. The data were collapsed over time and expressed as proportions, such that the frequency for addressing each type of costly vs. noncostly sharing was divided by the total number of times in which costly vs. noncostly sharing was addressed (e.g., addressing costly all / addressing costly all + costly some + noncostly).

**Table 8**

*Means and Standard Errors of Addressing Subtypes of Prosocial Behavior using Frequency Scores*

	Addressing	
	<i>M</i>	<i>SE</i>
	(per sibling per time point)	
Instrumental Helping		
Acting	3.14	.26
Providing Information	1.50	.16
Sharing		
Cost		
Costly-All	3.09	.25
Costly-Some	.73	.09
Non-Costly	.19	.04
Ownership/possession		
Possesses and Owns	.68	.09
Possesses but no one Owns	2.45	.24
Possesses but not Owns	.87	.10
Comforting		
Verbal	.26	.05
Non-Verbal	.16	.03
Protecting		
Physical	.22	.06
Psychological	.02	.01

the analysis revealed a marginally significant interaction of responses by subtypes,  $F(1.70, 64.78) = 2.90, p = .05, \eta^2 = .07$ . Pairwise comparisons indicated that siblings were proportionately more likely to share ( $M = .17, SE = .02$ ) than to reject sharing ( $M = .13, SE = .01$ ), when they were asked to give up some of the resources. Contrary to expectations, siblings were proportionately more likely to reject noncostly sharing ( $M = .10, SE = .01$ ) than to engage

in noncostly sharing ( $M = .06$ ,  $SE = .01$ ). No significant difference was found for addressing sharing relative to rejecting it in circumstances involving sharing all of the resources.

**Addressing relative to rejecting ownership vs. possession sharing.** In order to examine how much siblings addressed (rather than rejected) ownership vs. possession sharing, a series of 2 (sibling: older and younger sibling) x 2 (response: addressing and rejection) x 3 (type of sharing ownership vs. possession: possesses and owns, possesses but no one owns, possesses but not owns) repeated measures ANOVA were conducted. The data were collapsed over time and expressed as proportions, such that the frequency for addressing each type of possession vs. ownership sharing was divided by the total number of times in which possession vs. ownership sharing was addressed (e.g., sharing the object that the child possesses and owns / sharing the object the child possesses and owns + possesses but no one owns + possesses but not owns).

The analysis indicated a significant main effect of subtypes,  $F(1.42, 54.25) = 81.36$ ,  $p < .05$ ,  $\eta^2 = .68$ . Further analysis revealed that there were significantly more opportunities to share when one of the siblings possessed the object but no one owned it ( $M = .56$ ,  $SE = .02$ ), than possessed and owned ( $M = .28$ ,  $SE = .01$ ), and possessed but did not own ( $M = .16$ ,  $SE = .01$ ) (i.e., the differences between all three means are significant). Moreover, the analysis revealed a significant interaction effect of responses by subtypes,  $F(1.88, 71.71) = 33.30$ ,  $p < .05$ ,  $\eta^2 = .46$ . Consistent with the expectations, pairwise comparisons indicated that children were proportionately more likely to engage in sharing ( $M = .60$ ,  $SE = .03$ ) than to reject sharing ( $M = .52$ ,  $SE = .02$ ), when they possessed an object that no one owned. Consistent with the hypothesis, children were proportionately more likely to reject sharing ( $M = .39$ ,  $SE = .02$ ) than to engage in sharing ( $M = .17$ ,  $SE = .02$ ), when they possessed and owned an object. Finally, as expected, children were proportionately more likely to engage in sharing ( $M = .23$ ,  $SE = .02$ ) than to reject sharing ( $M = .08$ ,  $SE = .01$ ), when they possessed an object but did not own it.

## Discussion

The aim of this study was to examine developmental changes in prosocial behaviors such as instrumental helping, sharing, comforting and protecting between siblings over a period of two years. A second goal was to investigate birth order effects on siblings' prosociality. Six research questions were addressed that collectively provide information concerning (1) how children express their needs within the context of sibling relationship, (2) how children respond

to manifestations of their siblings' needs, and (3) the extent to which siblings engage or fail to engage in different types of prosocial behaviors. The description of the findings related to each set of research questions is discussed below.

### **Behavioral Cues Indicating Siblings' Needs**

The first aim of the current study was to investigate the different ways in which children expressed their needs within the context of the sibling relationship. We expected that there would be more expression of needs at time 1 than at time 2, given that younger children might be more often in need of others' assistance. Inconsistent with this hypothesis, findings revealed that the expression of need was not considerably different at time 1 than at time 2. Thus, in our sample of siblings, the expression of need remained relatively steady over time. It may be important to consider that even the eldest children in the sample were only 6 years old, and thus may continue to be in need of other's assistance on many occasions. However, in line with expectations, younger siblings provided more cues indicating need; that is, older siblings had more opportunities to respond prosocially to others' needs, as compared to their younger counterparts. Therefore, this finding highlighted that the sibling relationship is a fruitful context for older siblings to develop prosocial skills. Younger siblings, meanwhile, were more often the recipients of prosociality; thus, via these experiences, secondborn siblings were exposed to a greater degree of prosocial modeling from their older counterparts.

Moreover, findings indicated that direct verbal requests and nonverbal requests were the least frequent behavioral cues, whereas parental intervention and indirect verbal requests were the most frequent cues. Previous research has shown that direct verbal requests and nonverbal requests are effective cues for eliciting children's prosociality (Brownell et al., 2009; Dunfield et al., 2011); yet it is apparent that siblings in our sample often failed to express their needs explicitly in this way. This could also partly explain the high occurrence of parental intervention, as parents might be attempting to clarify their children's implicit expression of needs.

In addition, when the different behavioral cues were expressed as proportions of the total number of cues at each time point, findings supported our hypothesis that behavioral cues including nonverbal requests and negative emotionality were used selectively as cues at time 1 compared to time 2, whereas direct verbal requests were used selectively at time 2. Similarly, as expected, less linguistically competent younger siblings were proportionately more likely than older siblings to provide nonverbal requests. Thus, as siblings' linguistic abilities increased over

time, they used proportionately fewer nonverbal cues and more verbal cues to convey their needs. In addition to linguistic abilities, improvements in children's emotional regulation capacities may explain why there were proportionately fewer expressions of negative emotionality at time 2.

Contrary to hypotheses, younger siblings were proportionately more likely than older siblings to make direct verbal requests; birth order analyses comparing 4-year-old firstborns and secondborns also indicated that 4-year-old firstborns received more direct verbal and nonverbal requests from their 2-year-old siblings than 4-year-old secondborns received from their 6-year-old siblings. In part, this finding could be explained by considering the heterogeneity of the direct verbal request category. For instance, direct verbal requests could be expressed as a complete question: "Can I have a piece of playdoh?", or solely by stating one word: "Playdoh!". Therefore, although younger siblings' verbal abilities may not be advanced enough to make requests in the form of full sentences, they could have made one-word requests frequently. Additional investigation may be required to confirm this assumption. Furthermore, due to the distinct role of older siblings within the sibling relationship as the more powerful party in controlling the siblings' interactions (and thus domineering their own preferences over younger'), it is possible that younger siblings might need to make more explicit requests to encourage older siblings to address their needs.

Besides, although previous findings showed that younger siblings need parental scaffolding more than older siblings to act on behalf of others (Dunfield et al., 2011; Svetlova et al., 2010), older siblings in this sample received parental intervention more than younger siblings. This finding might imply that parents may perceive their younger children to be less powerful or less capable of expressing their needs, and thus that they directed more cues toward their older siblings in a way to counterbalance younger children's incompetence of expressing their needs. Moreover, it is plausible that parents encouraged older siblings to be more prosocial given older siblings' role-related responsibilities.

Unexpectedly, older siblings were also proportionately more likely than younger siblings to express negative emotionality (although the frequencies of expressing negative emotionality were not significantly different between older and younger siblings). One possible explanation could be that negative emotionality was a particularly conspicuous cue for the coders, who perhaps noted these behavioral cues on every occasion that they arose. Combined with the fact

that younger siblings expressed more varied and explicit needs compared to older siblings, this may have resulted in a larger proportional score for older siblings' negative emotionality.

### **Responses to the Manifestation of Need**

The second aim of this study was to investigate how children respond to their siblings' manifestations of need. Since older siblings received more cues indicating their sibling's needs, we examined the occurrence of each type of response relative to the total number of opportunities to be prosocial, in order to maximize the interpretability of the findings. The intimacy of sibling relationships may facilitate children's understanding of their brother or sister's desires and emotions (Dunn, 1983; Dunn, Kendrick & McNamee, 1981). And indeed, in accordance with predictions, children were more likely to address and reject opportunities to be prosocial than fail to respond to the needs, suggesting that they were relatively attuned to their siblings' expressions of need.

Our findings are also in line with research (Dunfield & Kuhlmeier, 2013; Eisenberg & Fabes, 1998; Zahn-Waxler et al., 1992) indicating that engagement in prosocial behavior increases with age. That is, children addressed their siblings' needs more at time 2 than at time 1, whereas they rejected opportunities to engage in prosociality more often at time 1 than time 2. Moreover, comparing time 1 and time 2, it seems that parents had less confidence in younger children's abilities to act on behalf of others, inasmuch as parents at time 1 were more likely to intervene before children could act. Similarly, younger siblings failed to respond due to parental intervention proportionately more than older siblings. Previous research has suggested that young children require sufficient time to act prosocially (Dunfield et al., 2011); it may be that parents in our study might not give young children enough time to respond. Furthermore, given the siblings' role-related responsibilities, it is possible that parents had higher expectations from the older siblings to address their younger sibling's need than the reverse. Interestingly, the proportional likelihood of not responding was not significantly different over time or between siblings. This absence of age effects implies that lack of understanding of cues is not the sole determinant of failing to respond to others' needs. Rather, for acting prosocially, children also need to identify an appropriate intervention to address the need and to have the motivation to act correspondingly (Dunfield, 2014).

Analysis of proportional scores revealed that older siblings engaged in prosociality proportionately more than younger siblings. In addition, the results of the repeated measures

ANOVA examining time by sibling by prosociality types indicated an interaction between time and sibling; that is, at time 1 older siblings addressed their younger siblings' needs more than younger siblings addressed the needs of their older counterparts. Nevertheless, at time 2, both siblings addressed each other's needs to the same extent. It should be noted that these findings did not emerge as significant in other analyses (i.e., time by sibling by response). In part, these findings can be accounted for by the pattern above indicating that parents tended to intervene before younger siblings had the opportunity to be prosocial. Additionally, the findings regarding the interaction of time, sibling and addressing responses highlight that the sibling relationship is a unique context for developing prosociality; that is, from time 1 to time 2, younger siblings may have learned to address others' needs from interacting with their older siblings. This could be a reason that at time 2 both siblings engaged in prosociality to the same extent. This interpretation could be examined by investigating the change in younger siblings' prosociality from time 1 to time 2 as a function of older siblings' prosociality at time 1. More generally, the age differences between siblings became less pronounced as children got older; that is, the difference between 2- and 4-year-olds was more evident than the difference between 4- and 6-year-olds.

Although we expected siblings' birth order to also be related to their frequency of acting prosociality, the findings failed to reveal the theoretically expected result suggesting that firstborn siblings would engage in prosocial behavior at age 4 more often than secondborn siblings at the same age (Dunn & Munn, 1986; Howe et al., 2015; White et al., 2014). It is noteworthy that, as compared to past research, this study used a particularly restrictive definition of prosociality. Specifically, we excluded behaviors that were beneficial for both the helper and the recipient (e.g., cooperation as in joint play), as well as affection/positive physical contact that was expressed without the signaling of any need (e.g., high fives). Thus, it is plausible that the inconsistency between the findings regarding birth order in the present study and previous studies is related to the different categorization of prosociality. It is also important to note that we *did* observe birth order effects for the specific categories of helping and comforting (i.e., but not for sharing and protecting). These findings also corroborate the argument that prosocial behavior types need to be distinguished from each other, in order to accurately examine their links with other social and cognitive factors.

Furthermore, both older and younger siblings rejected being prosocial to the same extent. The similarities in rates of rejection across siblings underscore that engaging in prosociality

could also be challenging for older siblings. It is important to note, however, that most rejections occurred in the context of sharing (see Figure 3); as previous research (Ross et al., 1994) argued, children are not willing to share partially due to possession vs. ownership rights, which are discussed further below.

**Variation in responses based on behavioral cues.** This study also aimed to examine whether there was an association between types of behavioral cues and siblings' responses to distinct manifestations of need. As anticipated, nonverbal requests such as reaching (Dunfield et al., 2011) and negative emotionality such as crying and fussing (Vaish et al., 2009) were apparently salient and persuasive for children, as these cues prompted prosocial behaviors more than any other cue. Other observable signs of need (e.g., struggling to fix a broken toy) which probably requires complex understanding of situational cues and needs inferential steps on how to intervene (Svetlova et al., 2010), provoked the least frequent prosocial behaviors.

In contrast to hypotheses, this study did not corroborate Brownell and colleagues' (2009) findings indicating that children are more likely to engage in prosociality when the recipient vocalizes his/her need. Brownell et al. (2009) argued that children may have interpreted the adult experimenter's verbalizations as compliance requests, increasing their likelihood of obeying (Brownell et al., 2009). In this sense, our study underscores the uniqueness of prosociality within the sibling relationship, such that direct verbal requests may be actively rebuffed in this relational context. Indeed, Perlman and Ross's (2005) study on the same sample of siblings suggested that power strategies are not necessarily followed by sibling compliance. Thus, even simple verbal requests such as "bring it here" could be perceived as an indication of power by siblings. Moreover, it is possible that siblings might have first attempted to express their need or desire through other behavioral cues that were not addressed. Therefore, in an attempt to exhibit their need explicitly, they escalated to a direct verbal request. For this reason, it is plausible that direct verbal requests were made more often in situations when the recipient of the cue was already predisposed not to comply. This proposition may clarify why direct verbal requests were rejected more than other cues. A sequential analysis would be required to test this speculation. In addition, direct verbal requests, by its nature, required an explicit response and it may be unlikely that a direct request is ignored. This might explain why children remained unresponsive to direct verbal requests less than other cues.

Although both direct verbal requests and nonverbal requests are explicit cues, they differ in their level of directness and consequently the extent to which they require an explicit response. Nonverbal cues, which seem to be less direct than direct verbal requests (e.g., nonverbal requests could happen by way of simply touching an object), were addressed frequently and were rejected infrequently, however there were many occasions that children were unresponsive to these cues. Conversely, as noted above, children seem not to remain unresponsive to direct verbal request, and thus as an explicit response, it was rejected more often.

Although the frequency of no response due to parental intervention was very low (i.e., on average less than one instance per session), it seems that parental intervention impeded children's responses to some cues more than others. Inconsistent with our hypotheses, parents were most likely to intervene before their children when the cue was a nonverbal request and least likely when it was negative emotionality. Perhaps negative emotionality was very persuasive for children; that is, children responded quickly upon receiving negative emotionality even before parents could intervene. On the other hand, since children were more likely to be unresponsive or to be slow to respond to nonverbal requests, it is possible that parents responded to this cue before children could do so. However, this conclusion calls for further investigation.

Furthermore, a significant three-way interaction of sibling by types of behavioral cue by responses was found. Indirect verbal requests and other observable signs of need are particularly implicit cues, and both were addressed more by older siblings relative to their younger counterparts. As such, this pattern may indicate older siblings' greater capacity to detect situational and implicit cues (Svetlova et al., 2010). Interestingly, older siblings also addressed parental intervention significantly more than younger siblings. Parents might use different way of intervening based on the children's age (Ross et al., 1994) and our study did not examine the specific ways in which parents intervened with each child. However, the findings of Brownell and colleagues (2009) were replicated here in some ways, in that adults' verbal requests directed children to be more prosocial. Ross and colleagues (1994) also have shown that, during a conflict, parents intervened verbally more often when they addressed older siblings than younger siblings. Thus, parents possibly intervened in a form of a direct verbal request more with older siblings compared to younger siblings, which resulted in older siblings' compliance to address their younger siblings' needs.

### **Engaging in or Failure to Engage in Prosocial Behaviors**

The third aim of the current study was to investigate the extent to which siblings engage or fail to engage in different types of prosocial behaviors such as instrumental helping, sharing, comforting, and protecting. Consistent with previous studies which have shown that instrumental helping emerges early in life (Warneken & Tomasello, 2006; Zahn-Waxler et al., 1992), children in this study engaged in instrumental helping frequently. On average, each child helped his/her sibling approximately 1.56 per hour (i.e.,  $4.69/3$  hours of observation = 1.56). Consistent with the experimental literature (Dunfield & Kuhlmeier, 2013; Liskowski et al., 2006; Warneken & Tomasello, 2006, 2007, 2008), our analyses suggest that understanding of others' instrumental or goal-directed needs and the capacity to intervene to address those needs has developed before children's second birthday; 90% of the 2-year-olds in our sample engaged in instrumental helping at least once during the observation period. Furthermore, although helping behavior did not vary over time or by sibling, our findings revealed an effect of birth order on helping. As expected, 4-year-old firstborns helped more than 4-year-old secondborns. Thus, the notion of being a "big brother/sister" and non-parental caretaking (Howe & Rinaldi, 2004; Stewart, 1983; Weisner & Gallimore, 1997) was confirmed in the case of helping, in addition to comforting (discussed below).

Children also shared frequently with their siblings (on average, 1.34 times per hour per sibling). Nevertheless, although the frequencies of children's sharing and helping behavior were similar, children also rejected cues that were aimed at eliciting sharing more than cues aimed at eliciting helping. That is, in contrast to instrumental helping, siblings were proportionately less likely to address than reject sharing. Moreover, the frequency of rejection of sharing decreased as children aged; that is, there was less rejection of sharing at time 2 than at time 1. This finding is consistent with research suggesting that sharing is challenging and later developing compared to instrumental helping (Brownell et al., 2009; Dunfield & Kuhlmeier, 2013; White et al., 2014). Additionally, comparing older and younger siblings illustrated that older siblings rejected sharing more than younger siblings. This finding might have implied that although rejection of sharing decreased over time, sharing was still challenging for older siblings. Nevertheless, this might also be associated with the costs involved in sharing, as well as possession vs. ownership rights (discussed below). In accordance with the mentioned findings, rejection of sharing was not

associated with birth order when age was held constant (i.e., when 4-year-old firstborn and secondborn children were contrasted).

Comforting was relatively rare (on average, .14 times per hour per sibling) compared to instrumental helping and sharing. It is possible that opportunities to comfort were relatively rare compared to helping and sharing, and comforting might also require a complex understanding of emotional cues as well as how to alleviate others' negative emotional states (Dunfield et al., 2011; Svetlova et al., 2010). Moreover, our findings suggested that the rates of older and younger siblings' comforting behaviors were not drastically different from each other, although older siblings rejected opportunities to comfort more than younger siblings. It is possible that older siblings might have caused more distress in younger siblings by teasing, tattling or hitting, and thus as a result, parents forced them to comfort their siblings (e.g., by saying "sorry"). As a previous study has indicated (Zahn-Waxler et al., 1992), as children age, they are less likely to show empathic concern when they cause the distress than when they witness it. Hence, this might be a reason why older siblings rejected opportunities to comfort more than their younger counterparts. Even so, it seems that comforting behavior is influenced by birth order; that is, 4-year-old first-borns comforted more than 4-year-old second-borns. It is possible that 2-year-olds were more distressed than 6-year-olds, therefore 4-year-old firstborns might have had more opportunities to comfort than 4-year-old secondborns. Moreover, firstborns perhaps were more skilled in alleviating the negative emotions of 2-year-olds than secondborns were to do so for 6-year-olds.

Similar to comforting, children engaged in protecting infrequently (on average, .08 times per hour per sibling). Protecting is a relatively complex form of prosociality in that it necessitates abstract thinking in terms of anticipating a potential need and acting correspondingly. These cognitive abilities might develop later in childhood (Haywood, 1980) than the age range included in this sample. This could explain the infrequent occurrence of protecting in our data.

Furthermore, the indoor environment in the family home might not be a context that provides children with as many protecting opportunities, as compared to an outdoor or less familiar environment. It would be useful for future studies to investigate the influence of physical context and environment on children's protecting behavior. In addition, protecting was almost never rejected. By definition, the recipient of protecting might not be aware of his/her own need, and thus will not ask others to protect her; even so, some needs may have been recognized by the

protector and ignored. Video records (as compared to transcripts) may have provided clearer data regarding this issue. In the current transcribed corpus, the only behavior that could potentially be considered as a rejection of protecting may be tattling, because children often seemed to tattle to in anticipation of their sibling's punishment from parents. However, tattling behavior was previously studied (den Bak & Ross, 1996; Ross & den Bak-Lammers, 1998) in the context of siblings' conflict. Overall, little is known about children's protecting behaviors, which merit further investigation.

**Variation in engaging in prosocial behaviors based on behavioral cues.** An additional aim was to examine whether there was an association between the presence of certain behavioral cues and siblings' engagement in different types of prosocial behaviors. Previous studies suggest that direct verbal requests and nonverbal requests are likely to elicit helping and sharing because these cues are particularly explicit in displaying a need (Brownell et al., 2009; Dunfield et al., 2011). Although we found that children in our sample frequently rejected direct verbal requests, when this cue was addressed, it elicited instrumental helping and sharing behaviors more than other cues. This suggests that direct verbal request may successfully convey the presence of a goal-directed need between siblings. Conversely, our findings revealed that nonverbal requests elicited sharing more than instrumental helping. On the other hand, it is possible that nonverbal cues exhibited an inadequate distribution of resources more than an instrumental need in naturalistic setting.

Interestingly, parents' intervention did not frequently precede children's helping acts. Thus, while parental intervention was the most frequent behavioral cue overall, children's instrumental helping behaviors apparently did not depend upon receiving parents' scaffolding. This finding is inconsistent with Dahl and colleagues' (2011) arguments that prosocial behavior is developed through parents' scaffolding of such behaviors. Rather, it supports other research suggesting that young children's helping behavior does not depend on parents' indirect or direct support (Warneken & Tomasello, 2013).

Comparing instrumental helping and sharing with comforting, comforting behaviors were emotion-focused rather than being goal-directed. Therefore, it is perhaps unsurprising that negative emotionality was more likely to elicit comforting than other cues, and in turn, that negative emotionality was least likely to elicit sharing. Along the same lines, nonverbal requests such as reaching or outstretched hand, which are argued to be an indication of inadequate

distribution of resources, never elicited comforting. Also as expected, other observable signs of need prompted protecting more than other behavioral cues. Considering that in protecting situations, the protector perceives a need to avoid impending harm, it makes sense that children were observing situational cues that highlighted the necessity of protecting others. In addition, anecdotally, coders noted that children's protecting behaviors mostly occurred when their parents were not present in the room, thus perhaps explaining why parental intervention never prompted protecting behaviors. Nevertheless, this speculation requires further investigation. Overall, these findings support Dunfield and Kuhlmeier's (2013) proposition that different types of prosociality may have distinctive underlying cognitive mechanisms, and are prompted by different types of behavioral cues.

With regard to the age-related changes, comparing time 1 and time 2, children's advancing linguistic abilities may account for the greater frequency with which direct verbal requests prompted instrumental helping at time 2. However, our findings failed to show that children's dependence on explicit behavioral cues decreased with age. This finding is particularly interesting considering that even adults might need explicit behavioral cues in order to recognize some needs. Negative emotionality elicited instrumental helping, sharing and comforting and parental intervention prompted sharing more at time 1 than at time 2. However, these findings might be accounted for by the more frequent occurrences of negative emotionality and parental intervention at time 1 than at time 2. Unfortunately, the interpretability of these findings is restricted to the analysis of the frequencies as we could not compute the proportional scores due to the limited sample.

In addition, the findings illustrated that the presence of some behavioral cues were related differently to older and younger siblings' prosociality. Specifically, younger siblings engaged in sharing more than older siblings upon receiving direct verbal requests and nonverbal requests. Given that older siblings expressed their needs through direct verbal requests and nonverbal requests less frequently than younger siblings, this finding might suggest that older siblings were more persuasive in expressing their need verbally and nonverbally. However, when the behavioral cue was negative emotionality or when the others' need had to be inferred from the situational indications (i.e., other observable signs of need), older siblings engaged in helping, sharing, and comforting more than younger siblings. One possible explanation is that older siblings had a better understanding of behavioral cues especially in terms of ambiguous cues

such as other observable signs of need. Furthermore, older siblings might have greater knowledge of how to intervene, especially in the case of negative emotionality. It is important to note that, in naturalistic settings, some cues such as negative emotionality did not necessarily express an emotional need (i.e., the reason for distress could be instrumental: crying to gain the possession of a teddy bear), which might lead to various prosocial responses. In other words, although some responses might be more appropriate than others, children might choose either problem- or emotion-focused strategies to address a need depending on the circumstances (Compas, Malcarne, & Fondacaro, 1988). For instance, in one session, the family dog bit through a piece of a child's peg board game, and the child started to cry. In this example, her sibling could have comforted her by hugging and saying "don't cry" or could engage in instrumental helping by repairing the broken board with a piece of tape (the sibling chose the latter response). In addition, the prosocial response, which is based on the helper's interpretation of the other's need, might be different from the recipient's perception of their own need. Therefore, we assume that identifying and enacting the appropriate response may be more challenging for younger siblings compared to their older counterparts.

**Frequencies of engaging in prosocial behavior subtypes.** Lastly, this study aimed to examine how frequently siblings engaged in (i.e., addressed) different subtypes of prosocial behaviors. We investigated two types of siblings' instrumental helping in a naturalistic setting: helping by doing an action and by providing information. Although there was proportionately more opportunity for helping by doing an action than by providing information, as expected, when helping required doing an action, siblings were more likely to reject helping than address it. On the contrary, when helping required providing information, siblings were more likely to help than reject it. There are two factors that could explain this difference. First, helping by doing an action encompasses physical costs whereas helping by providing information does not involve such costs. Although it is argued that the cost of helping does not prevent children from engaging in this form of prosociality (Warneken & Tomasello, 2008; Warneken et al., 2007), it seems that physical cost of doing an action may nevertheless be influential in the rate of helping (e.g., "Help me pick up the airplane?" vs. "Can you help me with this big mess?"). Second, children engage in helping by providing information even before they become verbal via pointing (Liszkowski et al., 2006). This sort of early helping called informative pointing, emerges earlier (i.e., 12-month-olds) than helping by doing an action (i.e., 14-month-olds;

Warneken & Tomasello, 2007). Thus, it might be easier for children to engage in helping by providing information since this kind of helping emerges comparatively earlier in ontogeny than helping by doing an action.

With regards to sharing, we examined two dimensions of sharing behavior. First, we examined how much sharing varies based on the cost of the behavior. Siblings were more often requested to engage in sharing that required giving up all of their resources (e.g., sharing a doll, or a book) than some of their resources (e.g., a bite of apple, or some of the blocks). As expected, the proportional likelihood of sharing was higher when children were requested to give up some (rather than all) of their resources. This finding suggests that sharing that involves giving up all the resources was difficult for children. This is consistent with Fehr and colleagues' (2008) studies, which showed that preschool children did not choose the sharing options that encompassed costs to them. In contrast, a willingness to engage in costly sharing may become more common in the school-aged years (for examples, see Warneken & Tomasello, 2014). Surprisingly, however, requests for “noncostly” sharing (e.g., for an older sister to give permission to her sibling to be in a cardboard house with her), while made infrequently, were often rejected. The finding implies that siblings themselves may not have perceived this sharing as being without costs. It is possible that children want to be the only possessor of an object; that is, by engaging in “noncostly sharing”, children would lose their privileged access to a resource, which seems to encompass some cost for them (i.e., in the example of sharing the cardboard house, the older sibling would no longer be the only possessor of the cardboard house). Although previous studies have shown that children made choices that benefit the recipient (i.e., sharing) when it is not costly for them (Fehr et al., 2008; Thompson, Barresi, & Moore, 1997), no previous research has defined noncostly sharing as a behavior that does not require giving up resources but instead giving access to resources. Our decision to do so was driven by our efforts to capture children's noncostly sharing in real life, where costs cannot be as carefully controlled via an experimental apparatus (Brownell et al., 2009; Fehr et al., 2008). Along the same lines, in an experimental setting, objects (e.g., snacks) are often given to children (e.g., Brownell et al., 2009; Dunfield et al., 2011; Vaish et al., 2009), whereas in a naturalistic context children themselves acquired or in many cases owned the object. Thus, in this context, it is reasonable that children may be reluctant to share their resources even when the instrumental cost of doing so is not evident to an observer.

With regards to the second dimension of sharing, we examined whether the sharer owns, possesses, or does not own the object. There were the most opportunities to share when one of the siblings possessed an object but neither owned it (e.g., cushions or mother's purse), whereas instances involving clear ownership (either by the possessor or the requestor) were less frequent. When children possessed an object that neither owned, it was more likely that they engaged in sharing than rejected it. Since ownership was irrelevant in these sharing situations, engaging in sharing might be influenced by other situational factors such as the sharer's current disposition (e.g., whether siblings had a fight before the request or not), reciprocity (e.g., whether the other sibling shared an object with the sharer earlier), or parents' presence or expectation. In contrast, when ownership was a relevant concern, siblings' sharing behavior was clearly influenced by this dimension. Children were more likely to reject sharing than to engage in sharing when they possessed and owned an object. In contrast, children were more likely to engage in sharing than to reject sharing, when they possessed an object but did not own it. This finding supports previous studies (Svetlova et al., 2010), which have shown children's reluctance to share their own possessions.

Moreover, in this study, the frequencies of verbal and nonverbal comforting were examined. The findings revealed that siblings engaged in verbal and non-verbal comforting to the same extent. This might imply that one of these two forms of comforting is not inherently easier for children than the other. Besides, it may be that not only understanding of emotional cues was difficult for children, but also the ability to select an appropriate strategy to alleviate distress was challenging for them.

Finally, with regards to protecting, children protected their siblings significantly more from physical harm than psychological harm. Arguably, anticipating the consequences of a physical harm might be easier for children than the consequences of a psychological harm. Somewhat related to this, research based on social domain theory has suggested that children at younger ages might be more attuned to welfare concerns in physical harm than in psychological harm (see Killen & Smetana, 2015).

### **Summary of Key Findings**

To summarize, the findings illustrated that sibling relationship is a unique context for the development of prosociality. Older siblings in our sample had many opportunities to be prosocial, as younger siblings needed assistance frequently. Also, children often failed to express

their need explicitly through direct verbal requests and nonverbal requests, and perhaps consequently parents intervened frequently to clarify children's ambiguous manifestation of need. Additionally, children's linguistic abilities and emotion regulation capabilities influenced the ways in which they expressed their needs; that is, they used nonverbal requests and negative emotionality selectively at time 1 and direct verbal requests selectively at time 2. Comparing older and younger siblings, older siblings received parental intervention more than younger siblings. Perhaps, parents perceived their younger children as less powerful and capable of expressing their needs, or they wanted to encourage older siblings to be more prosocial considering their hierarchical role in the sibling relationship.

With regard to children's responses to their siblings' manifestation of need, findings revealed that children responded either by addressing or rejecting more than by not responding. Children's engagement in prosociality increased as children aged. Furthermore, one analysis indicated that at time 1, older siblings addressed their siblings' need more than younger siblings, however, at time 2, both siblings addressed each other's needs to the same extent. Thus, apparently as children get older, the age differences become less pronounced. In addition, it is possible that younger siblings' understanding of cues as well as identifying the way they could intervene improved due to interacting with older siblings. Nevertheless, it seemed parents may have had less confidence in younger children's abilities to intervene, and thus parents addressed needs more often before younger siblings could act.

Moreover, findings suggested that behavioral cues such as nonverbal requests and negative emotionality were particularly persuasive for children, as they elicited prosociality more than other cues. However, other observable signs of need (which required inferential steps to recognize the need) elicited least frequent prosocial behaviors. The explicit cue of direct verbal request provoked explicit responses; however, perhaps due to the fact that direct verbal requests could be inferred as a bid for power from a sibling, siblings often rejected this cue, in addition to addressing it. In contrast, this might not have been the case when children received a direct verbal request from their parents. In addition, it seemed that children responded quickly to their sibling's negative emotionality, even before parents could intervene. Finally, comparing older and younger sibling, findings highlighted that older siblings were more capable than younger siblings of addressing implicit cues such as indirect verbal requests and other observable signs of need.

In addition, this study indicated that children engaged in instrumental helping frequently. Also, helping behavior was influenced by the birth order; that is, firstborns helped more than secondborns at the same age. Children also engaged in sharing frequently, however in comparison to helping, children rejected sharing more than helping. Nevertheless, rejection of sharing decreased over time. This implied that sharing is challenging for children and it develops later. Moreover, comforting (which required an understanding of emotional cues) happened rarely and firstborns engaged in comforting more than secondborns at the same age. Similar to comforting, protecting happened infrequently. Besides requiring developed cognitive skills in anticipating a potential need, the home environment might not provide children with opportunities to protect each other. Putting aside tattling, protecting behaviors were rarely rejected.

In addition, we found that children's engagement in different prosocial behaviors varied based on the behavioral cues expressing the need. For instance, although direct verbal requests were frequently rejected, when they were addressed, they prompted instrumental helping and sharing more than other cues. In addition, nonverbal requests seemed to indicate inadequate distribution of resources more than instrumental needs, as they resulted in sharing more than helping. Moreover, although parental intervention was the most frequent cue, children's helping did not depend on receiving this cue. Also, given that comforting behaviors are emotion-focused, negative emotionality elicited comforting more than other cues. Situational cues such as other observable signs of need prompted protecting more than any of the other cues. Therefore, this is in line with theory suggesting that different types of prosociality may have distinctive underlying cognitive mechanisms, and are prompted by different types of behavioral cues (Dunfield et al., 2011; Dunfield, 2014).

Lastly, we found that some types of prosocial behaviors may be inherently easier for children to enact. Children were more likely to help when it required providing information than acting. Moreover, the cost of sharing influenced children's engagement in sharing; that is, when they had to give up all of their resources, they rejected sharing, whereas when they had to give up some of the resources, they engaged in sharing more frequently. Inconsistent with our expectation, giving access to the resources was apparently not perceived by children as sharing without any cost. Thus, they rejected sharing more than engaging in it when they had to give access to the resources. In addition, when the ownership was clear, children favored owners over

possessors. That is, they shared more when they did not own the object, and rejected sharing when they owned the object. With regard to the comforting behaviors, siblings engaged in verbal and non-verbal comforting to the same extent. And finally, children protected each other from physical harm more than psychological harm, which might show their particular attunement to others' physical (rather than psychological) welfare.

### **Limitations**

This study has a number of limitations. A major limitation is that pre-transcribed data was used in this study, within which nonverbal behaviors were not initially coded for the purpose of examining prosocial behavior. Even very well described coding in terms of nonverbal behaviors has some restrictions. For this reason, it is possible that we have missed some nonverbal prosocial behaviors in all four categories. It is important for future research to include visual records of siblings' interactions in the naturalistic environment. This would allow researchers to more easily detect prosocial behaviors, as well as more subtle cues that might elicit or fail to elicit them.

Furthermore, in this study, we only investigated two types of instrumental helping (i.e., helping by doing an action and by providing information). Thus, we did not focus on how helping might vary based on other dimensions. One important consideration could be the contrast between the helper's and the recipient's need. For instance, it would be useful to examine whether children's rates of helping their sibling vary depending on whether the other's need or desire is in contrast to the helper's own goal or desire. For instance, a goal conflict would occur if a child requests her sibling to help clean the playing room while the sibling is still playing there. Thus, it would be helpful to investigate other dimensions of instrumental helping within the sibling relationship.

Moreover, this study was based on the premise that siblings' sharing behavior would be influenced by the cost of sharing as well as issues of ownership. Yet, the specific type of object in question might also impact siblings' sharing behaviors. This study did not take into account whether or not the object under consideration was food, a toy, or even parents (e.g., "I want Daddy to be in my group"). Some objects are more difficult to share (e.g., food, from an evolutionary perspective; Warneken & Tomasello, 2014) or have emotional consequences, thus it would be helpful to examine variations in sharing behavior across different types of resources.

Similarly, with respect to comforting, the coding only differentiated between verbal and nonverbal comforting. However, comforting behaviors might vary under different circumstances; such that whether or not the child is the cause of distress. Thus, it would be useful to study different variations in comforting behaviors as well.

Another limitation is the relatively small sample size used in this study ( $N= 39$  families). Out of six 90-minute sessions at each time point, only two sessions were studied for the purpose of this study. Thus, although each family was observed for three hours at each time point, the frequency of some behaviors was nevertheless very low, which restricted the statistical power to examine some effects, especially when the data were computed as proportions.

Another limitation is generalizability of this study, as participants represented a homogeneous middle class sample of European Canadians. Thus, the findings might not be generalizable to the other groups. For instance, comparing this group to a group of children from a collectivistic culture, it is possible that in collectivistic cultures the role of firstborns in helping and taking care of their younger siblings is amplified (Weisner & Gallimore, 1977). Comparing children in indigenous-heritage families with children in our sample, the former regularly take initiatives in contributing to family household work in order to be considered as a member of the family. In addition, children in indigenous-heritage families who had a younger sibling were reported to perform complex caregiving behaviors such as changing diaper or bathing a child (Alcalà, Rogoff, Mejía-Arauz, Coppens, & Dexter, 2014). Moreover, in the case of sharing, children in individualistic cultures may be more likely to assertively/aggressively express their needs (i.e., ask for or take what they want) compared to children in collectivistic cultures (Rao & Stewart, 1999). In addition, the data were collected in the 1980s and since then, parenting styles have likely changed. Although our study did not focus on the parenting styles per se, the findings related to parents' intervention might not be replicated in the current decade.

A final limitation of this study is that although younger and older siblings at age 4 are comparable in the sense of investigating birth order effects, we cannot entirely disentangle age and birth order effect because of the fact that all of the 2-year-olds and all of the 6-year-olds were respectively younger siblings and older siblings. Thus, our findings cannot speak of the behavior of 2-year-old older siblings or 6-year-old younger siblings.

## **Implications and Conclusions**

Despite the limitations, this study adds to the existing literature on prosociality between siblings in early childhood. Specifically, this study highlighted the nature and the prevalence of different types of behavioral cues that may or may not elicit prosociality in the siblings' day-to-day interactions. In this sense, this study provided a useful extension of Dunfield's (2014) experimental work in a naturalistic setting wherein children were interacting with a familiar age-mate rather than an adult experimenter. Further, it is important to note that the current study's focus was particularly on the first step necessary for acting prosocially (i.e., recognizing the behavioral cues indicating a need), and further investigation is necessary that emphasizes the other steps, including identifying an appropriate intervention and the motivation to act. Nevertheless, this study provided a comprehensive coding scheme for detecting behavioral cues and prosociality types in children's naturalistic interaction, which could be applied to other relationships (e.g., friendships) and contexts (e.g., the school environment) in future research.

Moreover, this study was one of the first to consider siblings' different responses (i.e., other than addressing and not responding, which have been the focus of most previous research) upon receiving distinct behavioral cues. Thus, the findings provided valuable information about the behavioral cues that elicited different types of responses (i.e., addressing and rejection) and failures to respond from the sibling. This study also indicated under what circumstances parents intervene to address their children's needs before siblings can act (no response due to parental intervention). The findings can be useful for parents in recognizing the types of behavioral cues that are most salient or persuasive for children (e.g., nonverbal requests), and when it may be useful to scaffold to increase the effectiveness of children's communication. Also, our findings suggest that it may be helpful to encourage parents to give their children enough time to act on behalf of others, whenever possible, prior to intervening themselves.

Moreover, this study was one of the first to chart the different ways in which siblings engaged in helping, sharing, comforting and protecting in naturalistic interactions; for instance, inasmuch as we distinguished between helping by doing and action and by providing information, as well as between verbal and nonverbal comforting. This information speaks to the extensiveness of siblings' opportunities to engage in each of the prosociality subtypes, as well as whether some are easier to enact than others. Further, to our knowledge, this is the first study to examine children's engagement in protective prosocial behaviors that require anticipation of a

need. Although they rarely occurred, protecting behaviors and their subtypes were defined and documented in the context of sibling relationships in this study.

In addition, this study provided new insight into siblings' relationship as a context for the development of different prosocial behaviors, particularly in early years of life. Departing from the trend in most research on sibling relationships, which focuses on negative dimensions of sibling interactions such as conflict and aggression (Dunn, 1983; Howe & Recchia, 2008), the findings of the present study shed light on the positive side of the sibling relationship.

Interestingly, siblings in this sample engaged in prosociality (i.e., 6.3 prosocial behaviors in each hour) to the same extent as being involved in a conflict (i.e., 6.4 conflicts in each hour on average; Ross et al., 1994). Specifically, our findings underscore the frequent opportunities that the sibling relationship affords for children to engage in prosociality (i.e., 15.9 opportunities per hour). Particularly, since younger siblings need more assistance, older siblings are provided with ample opportunities to be prosocial. Although it was not directly examined, younger siblings might also have the opportunity to learn how to act on behalf of others from interacting with prosocial older siblings. Overall, understanding of others' needs and desires appears to be fostered and facilitated within the sibling relationship.

In addition, the longitudinal dataset that formed the basis of this investigation allowed us to study the development of prosociality over time. Findings regarding age-related changes revealed how children's responses to cues as well as their engagement in the different types of prosociality changed over time. In turn, analyses of the structural features of the sibling relationship (i.e., birth order effects through analyzing both younger and older siblings' prosocial behavior at age 4) provided new information about complementary and reciprocal dimensions of the sibling relationship (Howe & Recchia, 2008).

Furthermore, the results suggested that children's responses to the different indications of need might be influenced by the relationship context. This has implications for parents and educators, by encouraging them to consider that relationships with different agemates (e.g., siblings or peers) are unique and distinct from adult-child relationships. Within each of these relationships, some specific behavioral cues might be particularly persuasive in encouraging children to act prosocially. For instance, the power imbalance might play a role in encouraging children to act prosocially in an adult-child relationship, but power dynamics may play out quite differently in sibling relationships. In addition, the findings imply the extent to which parents are

involved in their children's prosocial behaviors and the effectiveness of their interventions. This finding may be particularly relevant to parents, inasmuch as it suggests that perhaps parents' direct instruction (e.g., "say sorry to your brother") might not be as effective as other socialization practices such as encouraging perspective taking and induction (e.g., "how would you feel if your painting was ripped off?", "he is crying because he likes his painting that you ripped off") in persuading children to be prosocial.

Last but not least, the findings might be helpful for programs aimed at promoting prosociality among preschoolers. Considering that other observable signs of need were one of the most effective behavioral cues that led children to help instrumentally and to protect, prosociality programs can focus more on teaching children to understand situational cues that indicate others' needs. Moreover, parents and educators can teach children how to negotiate between their own and others' desires after receiving a direct verbal request, especially in the case of sharing. In addition, parents and educators may play an important role in teaching children how to intervene effectively upon observing others' needs, especially with respect to negative emotionality. Since understanding of emotional cues and alleviating distress might be difficult for children, it may be helpful if parents or educators relate others' negative states to the child's personal experiences ("do you remember once that happened to you? What helped you feel better?"). This way, children can more effectively identify different ways to address the emotional needs.

### **Future Directions**

Overall, the results of present study provide an overview of the dynamics of siblings' prosociality in the naturalistic environment. Yet, there are several emerging questions that call for additional study.

First, the present study's focus was only on prosociality between siblings in a naturalistic setting. Sibling interactions are characterized by a long and intimate relationship history. In this sense, children might have particularly nuanced understanding of the behavioral cues indicating the needs of their siblings, as compared to their friends or peers. On the other hand, the sibling relationship is also involuntary and interminable, and may thus not require the maintenance work that is involved in children's other voluntary close relationships. Therefore, in an attempt to keep a friendship, children might be more motivated to engage in prosociality towards their friends (see Berndt, 1985). Thus, direct comparisons of siblings and friends in early childhood may

clarify the extent to which children's understanding of behavioral cues as well as their motivation to act prosocially varies across different relationships with agemates.

Second, the findings revealed that parental intervention was the most frequent behavioral cue, however this behavioral cue was not addressed by siblings frequently. As argued earlier, parents might request their children to act prosocially in several different ways; for instance, parental intervention might happen by way of induction, preaching, threatening punishment, directly or indirectly requesting an action or in terms of a nonverbal request. Thus, it is possible that each type of parental intervention provokes different responses. If it does, the findings would be beneficial for parents in identifying the most effective ways of intervening with siblings. Moreover, as argued in the literature, some parental socialization practices might promote prosociality (e.g., modeling, encouraging perspective taking; e.g., Hammond & Carpendale, 2015; Pettygrove et al., 2013) or they might have detrimental effects (e.g., praising, material reinforcement; e.g., Warneken & Tomasello, 2008). Thus, it would be interesting to study the prevalence of different parental socialization behaviors following their children's prosociality or lack thereof in a naturalistic setting.

Third, the present study was aimed to capture the opportunities that siblings have for acting on behalf of others. As mentioned previously, all of the siblings' attempts to be prosocial were coded as engagement in prosociality regardless of whether the behavior was actually experienced as helpful by the recipient. Thus, it is important to extend this study by examining the effectiveness of siblings' prosocial behaviors.

Fourth, as mentioned in the method section, at time point 2, some families had a third child. The interactions and prosocial behaviors between both firstborn and secondborn siblings with their thirdborn sibling were not studied. As argued by Dunn, Kendrick, and McNamee (1981), children's understanding of others' need is fostered upon arrival of a new baby into the family. If it does, then both firstborn and secondborn siblings' prosocial behaviors might have been affected by the arrival of a new child. This is particularly the case for secondborns who were initially the youngest children in the family, after the arrival of a new baby, become the middle sibling who might have more opportunities to address the baby's needs. In addition, given the role-related change for the secondborn siblings, it is not clear to what extent firstborns' and secondborns' prosocial behaviors might change while interacting with each other.

Last, prosocial behaviors such as protecting that require anticipating a need from a potential harm have been understudied. Although it could be argued that protecting is goal-directed in some senses, the cognitive mechanism that underlies this behavior is not clear yet. As discussed earlier, this kind of prosociality might happen more among older children and outside of the home environment. Thus, it is important to examine the factors that may influence the occurrence of protecting, such as age and environmental context.

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## Appendix A

### Topography of Family Behavior (Ross et al., 1994)

Code	Action	OTM	other/mvmt
ACC	accept	OTN	other/nv
AGN	agree/nv	OTO	other/object
AGV	agree/v	OTV	other/verbal
APO	apologize	PAF	permit axn/father
ASI	ask/info	PAM	permit axn/mother
ASP	ask/permission	PAO	permit action/older
BHW	bodily harm w/ weapon	PAP	push away, pull
BOH	bodily harm	PAY	permit axn/younger
BRI	bribe	POC	positive contact
COM	comfort	PRR	praise
CRY	cry	PRN	protest/nv
DAF	describe action/father	PRV	protest/v
DAM	describe action/mom	REA	request action
DAO	describe action/older	REF	refuse
DAY	describe action/younger	REL	release
DEF	describe/father	REP	reprimand
DEM	describe/mom	RES	resist
DEO	describe/older	RHN	request help/nv
DEY	describe/younger	RHV	request help/v
DIN	disagr/nv	RON	request object/nv
DIO	destroy/obj	ROP	request object/possessively
DIV	disagr/v	ROV	request object/v
DOB	desc obj	SHN	show/nv
DOP	desc obj/possessive	SHV	show/v
EMF	emot/father	SMI	smile
EMM	emot/mother	STO	stop
EMO	emot/older	SUA	suggest action
EMY	emot/younger	SWE	swear
EXC	exclamation	TAK	take
FUS	fuss	TAO	take over
GIV	give	TAT	general tattle
GRE	greet	TEN	tease/nv
HEL	help	TEV	tease/v
HOL	hold	THA	thank
IMN	imitate/nv	THR	threat
IMV	imitate/v	THT	throw to
INR	invoke rule	TOO	touch obj
INS	insult	TOP	touch person
JUS	justify	TTB	tattle/baby
LAU	laugh	TTO	tattle/older
LOO	look	TTY	tattle/younger
MIO	misuse obj	TUG	tug
NON	not notice	VEP	verbal play
NOR	no resp	VOC	vocalization
OFH	offer help	WIO	withdraw object
OFN	offer/nv	WIP	withdraw physically
OFV	offer/v		
OTC	other/contact		
OTH	other/general		

Note:

\*Yellow refers to the codes that may indicate cues and purple refers to the codes that may indicate prosocial behaviors, although as noted above, coders did not rely exclusively on these codes.

## Appendix B

### Excerpts of Transcripts Including each Prosocial Behavior Subtype

An example of instrumental helping-action

F093.DON (Time point 2)

```
15 Y ROV 0 ACT 10 1 CA 0 1
15 I WANT THIS COLOUR BROWN.
16 Y SHN 0 ACT 10 1 CA 0 1
16 (POINTS TO THE COLOUR IN THE
16 COLOURING BOOK)
17 O DOB Y ACT 11 1 CA 0 1
17 BROWN
18 Y AGV 0 ACT 12 1 CA 0 1
18 BROWN
19 O GIV Y ACT 13 1 CA 0 1
19 (FINDS A BROWN CRAYON AND OFFERS
19 IT TO her)
20 Y ACC 0 ACT 14 1 CA 0 0
```

Description:

In this example, younger<sup>1</sup> sibling requested a brown crayon in two ways: direct verbal request as coded ROV<sup>2</sup> and non-verbal request as coded SHN by pointing. Older sibling found a brown crayon and gave it to him.

An example of instrumental helping-informative pointing.

F011RR.OUT (Time point 1)

```
37 O ASI Y ACT 1 9 CA 0 1
37 WHERE'S THE BABY?
38 Y OTV 0 ACT 2 9 CA 0 1
38 IT'S UPSTAIRS.
```

Description:

In this example, older sibling asked for information from younger sibling about the baby and she provided the information. Cue is direct verbal request.

An example of sharing

F011RR.OUT (Time point 1)

28	0	PRV	Y	CGPR	1	7	CO	0	1
28		NO, THAT'S		MINE.					
29	Y	DIV	0	CHDE	2	7	CO	0	1
29		IT'S		MINE.					
30	0	DIV	Y	CHDE	4	7	CO	0	1
30		MINE							
31	Y	NOR	0	YSTP	5	7	CO	0	0
32	Y	OFN	0	ACT	1	8	CA	0	0
33	0	ACC	Y	ACT	2	8	CA	0	0

Description:

In this example, older sibling protested verbally about the object that younger took it (owned by older sibling) by saying “No, That’s mine” (i.e., this part will be coded as an instance that older sibling refused to share). Younger disagreed: “It’s mine”. However, he/she offered it back to older and older accepted. This is an example of younger sibling sharing in which the sharer possessed the object (owned by the other child) and was costly for the sharer to share the object. Cue is indirect verbal request.

An example of comforting- nonverbal

F014.RR.OUT (Time point 1)

380	Y	FUS	0	CRCV	7	36	CO	0	0
381	0	DIO	Y	CHAO	8	36	CO	0	1
381		(STOPS BUT THEN		CONTINUES RIPPING)					
382	Y	PRV	0	CRCV	9	36	CO	0	1
382		HEY							
383	F	PRV	0	MSYV	10	36	CO	0	1
383		HEY							
384	F	REA	0	MSYV	10	36	CO	0	1
384		COME HERE YOU STOP		...STOP					
384		BOTHERING HER							
385	0	NOR	Y	YNOR	11	36	CO	0	0
386	0	POC	Y	ACT	1	37	CA	0	1
386		(KISSES Y)							

Description:

In this example, younger sibling fussed because older sibling ripped her playing book. Older sibling had a positive contact (POC) with younger sibling by kissing her. Cues are fussing (i.e., negative emotions) and parental intervention by the father.

An example of comforting- verbal

M285RR.OUT (Time point 1)

180 Y CRY O ECRY 7 16 CO 0 0  
181 O COM Y POTH 8 16 CO 0 1  
181 IT'S OKAY

Description:

In this example, older sibling comforted younger sibling by saying: “it’s okay”. The cue in this example is crying (i.e., negative emotionality).

An example of protecting- physical

M104RR.OUT (Time point 1)

64 (BOTH Y AND O ARE SHARING A TOY  
64 USED WITH PLAYDOH.  
65 O REA Y ACT 1 11 CA 0 1  
65 DON'T PUT YOUR FINGER IN THERE.  
65 (REFERRING TO THE TOY WHICH IS  
65 LIKE A PRESS AND WOULD HURT IF  
65 A FINGER GOT CAUGHT IN IT.

Description:

In this example, older sibling warned younger sibling not to put her finger in the toy, as it could hurt her. The behavioral cue in this example is other observable sign of need, as the potential physical harm was perceived from a situational cue (i.e., younger sibling was playing with the mentioned toy).

An example of protecting-psychological

F265RR.OUT (Time point 1)

Y bites O’s arm. Y is in trouble because M and F saw that Y bite O. M and F say to Y: “you don’t bite”, “do you like me bite you?”. Y says to F: “I didn’t bite” (Lie). O to F: “she was playing”

Description:

In this example, Y is in trouble because of biting O’s arm. M and F talk with her in a serious manner. O justifies Y’s action as she was playing, in order to prevent Y from being punished.

The cue for this example is other observable signs of need (OOS). The actual excerpt is not presented for this example as the incident transcription continued for one whole page.

**Notes:**

<sup>1</sup>O= older sibling, Y= younger sibling, M= mother, F= father

<sup>2</sup>ROV is the behavioral code for request object verbally, SHN is the behavioral code for show non-verbally, REA is the behavioral code for request an action, FUS is the behavioral code for fussing and POC is the behavioral code for positive contact. Detailed information regarding other behavioral codes is presented in Appendix A.

**Notes for Coding the Sequences:**

1. When one of the children expresses a need, the line number that contains a request/behavioral cue is coded as the start of the sequence.
2. The response of the other child to her/his sibling's expression of need is coded as the end of the sequence.
3. When there are several rejections in a row without any additional cues intervening, all the rejections are coded in one sequence (i.e., as a single rejection) and the line number ends at the last rejection. However, in cases where there is a cue followed by a rejection, followed by another cue and another rejection, each cue and rejection response should be coded separately.

## Appendix C

### Behavioral Cues that May or May not Elicit Prosociality

Cues	Examples
<p><b>Direct verbal request (DVR)</b> Directly asking for helping, sharing, or comforting.</p>	<p>“Please give me my teddy”; “Can I have a noodle (playdoh) please?”; “Macaroni”; “I need the red crayon”; “Don’t”</p>
<p><b>Indirect verbal request (IVR)</b> Verbal expression of need without direct request</p>	<p>“I am cold”; “I want to color the sky blue”; “I don’t have as many stickers as you”; “I am feeling really sad”, “I’m sick of you doing that”; “Please”; “Cory”; “That’s mine”</p>
<p><b>Nonverbal request (NVR)</b> Nonverbal behavior that is clearly intended to communicate a need.</p>	<p>Pointing, reaching, tugging, taking</p>
<p><b>Negative emotionality (NEMO)</b> Fussing, crying, upset facial expression.</p>	<p>‘Younger child took away older child’s slippers. Older child Cries’; ‘Older child ate the younger child’s macaroni from his plate. Younger child fusses.’</p>
<p><b>Other observable signs of need (OOS)</b> (excluding negative emotionality)</p>	<p>Broken tower; Cup fell on floor; Trying: Ex: Y trying to get up on the counter</p>
<p><b>Parental intervention (PI)</b> Parent intervenes and asks child to help.</p>	<p>Younger child cries and wants the bottle. Mom requests from older child: “Give it to Timmy”.</p>

### **Notes for Behavioral Cues:**

- If the question is incomplete (e.g., “do you know...?”) or it is not clear what the child meant (e.g., “it is ... you mind ... that?”), the incident is not coded.
- If the action of tugging and pulling happens back and forth during the GAME sequence, it is not coded.
- If the action of taking is followed by a ‘no response’, it is not coded (for more information see Note 1 in sharing). However, if the action of taking occurs with other cue(s) and is followed by a ‘no response’, it is coded.
- Fake crying and fake fussing are not coded as negative emotionality.
- If something happened in the past, or a need was expressed in the past, but the sibling addressed it after a period of time without any further cue(s), the cue for this instance is coded as ‘other observable signs of need’ (OOS). This includes the instances when the child’s request is not addressed (i.e., this could be a rejection or no response) by the sibling and thus parents intervene to prompt the sibling to address the need. The behavioral cues in these sequences are both ‘parental intervention’ (PINT) and ‘other observable signs of need’ (OOS).

**Appendix D**  
**Responses to Cues**

<b>Response</b>	<b>Definition</b>	<b>Examples</b>
<b>Addressed</b>	Child engages in prosocial behavior, regardless of whether it is ultimately successful in meeting the other's need	Instrumental helping, sharing, comforting, and protecting
	Coded further for type: see Appendix C	
<b>No response</b>	No response is made to the cue.	By continuing to do/play what he/she was doing/playing before.
<b>No response (PI)</b>	When parents respond to the need before sibling responds to the manifestation of need.	
<b>Rejection</b>	Sibling rejects the child's request or expression of need.	By disagreeing: "No"; providing reasoned argumentation: "you can't wear my T-shirt, it's for boys" "you fake it!"; Laughing, hitting and teasing when the other's is distressed, fussing and resisting to give

**Notes for Responses:**

- Prosociality involves doing an action. So if the child does not respond to a request and consequently by 'not responding' leads to the other child having it, it coded as a failure to respond (not as addressing).

- If the sibling's response is unrelated to the cue(s), it is coded as 'no response'.
- If the response to the need is 'rejection', types of prosociality are coded only for sharing (i.e., costly/non-costly; ownership) and instrumental helping (i.e., informative or acting), but not for comforting and protecting.
- If there are two consecutive responses that contradict each other, the later one will be coded. For instance, if there is a "no response" code and a "rejection" code respectively, the instance is coded as a rejection. If there is a "resisting to give an object" code and a "releasing an object" code respectively, only the later response is taken into account.
- If there is an instance where the child asks a question and the sibling responds with: "I don't know," it is coded as no response.

## Appendix E

### Types of Prosocial Behavior

Prosocial behavior subtypes	Definition	Types
<b>Instrumental helping</b>	Assisting others to reach their instrumental goals, except <sup>1</sup> when those goals are better characterized as fitting into one of the other categories (sharing and comforting)- Cooperation <sup>2</sup>	<p>Instrumental helping happens by way of</p> <p><b>Acting:</b> By doing an action/movement in order to help others reaching their goals. Ex: Y: “Can you move your car?” O Plays with Lego: “Why?” Y: “Cause I have to go over there” O moves the car so Y can get by. (O stops playing with Lego to help) Ex: you are cold and you want a blanket and I hand you one.</p> <p><b>Informative pointing<sup>3</sup>:</b> Providing information to others to help them reach their unfulfilled goals. Informative pointing could be a physical action of pointing (i.e., showing) or a verbal response. Ex: O: “where is my truck?” Y: “there it is.”<sup>4</sup></p>

**Notes for Instrumental Helping:**

<sup>1</sup> If an action could be equally characterized as sharing or instrumental helping, it is coded as the former.

<sup>2</sup> It should be noted that any instances of helping that could be beneficial to the helper himself, or where the helper shares the same goal, are considered as cooperation (a joint activity/play) and will not be coded as instrumental helping.

<sup>3</sup> If one of the children ask for information and the sibling responds as “I don’t know”, this is

not coded as instrumental helping- informative pointing, because the sibling does not provide helpful information.

<sup>4</sup> If one instance of helping involves both acting and informative pointing, the instance is coded twice for each one of the subtypes.

<p><b>Sharing</b></p>	<p>Actions that compensate for inequality of the distribution of resources<sup>4</sup>. If the actor possesses or owns the object, it is categorized as sharing; if not it is categorized as instrumental helping<sup>1, 2, 3</sup>.</p>	<p>Coded into one of three subtypes:</p> <ul style="list-style-type: none"> <li>a) The sharer possesses and owns the object (coded as ‘owns’<sup>5</sup>).</li> <li>b) The sharer possesses but does not own the object (coded as ‘possesses’).</li> <li>c) The sharer possesses the object that nobody owns or for which ownership is unclear (coded as ‘no one owns’).</li> </ul> <p>Also coded into one of two subtypes on the basis of whether there is a cost involved:</p> <p><b>Costly sharing:</b></p> <p>Giving up resources.</p> <p>Further coded into (a) some of (i.e., could be more or less than half), or (b) all of the resources.</p> <p>Ex: Y wanted to build a tower and O gave up some blocks to do it.</p> <p>Ex: Two siblings are playing with older child’s playdoh.</p> <p>Y: “A big piece.” (Referring to playdoh)</p> <p>O: “Here you can have it!”</p> <p>Ex: Younger sibling wants a cup that older sibling is using. Older sibling gives it to her.</p> <p><b>Non-costly sharing:</b></p> <p>Giving access to the resources without giving up your own access to them</p>
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		<p>Ex: Y has a blanket on him and O wants to be covered too, so Y let her come under the blanket with him.</p> <p>Ex: Colouring on the same page of a colouring book</p>
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**Notes for Sharing:**

<sup>1</sup> It should be noted that situations in which an object is taken by the recipient (rather than given by the sibling) are not coded as sharing. However, if the action of taking was unsuccessful, it shows an effort representing a non-verbal request for sharing that was refused (e.g., the younger sibling tries and fails to grab his older sibling’s markers).

<sup>2</sup> Turn taking instances are typically excluded from the sharing category because in most cases it is a predetermined agreement made before the game between siblings (e.g., giving each child an opportunity to roll the dice in the game). However, there are instances where turn taking is not associated with an organized game, which are therefore coded as sharing (e.g., “It’s my turn to play with Daddy” and “It’s my turn to play with the baseball bat”).

<sup>3</sup> If the action of releasing an object is a result of tugging and/or pulling from the person’s hand, it is not coded as sharing (e.g., O releases markers as a result of Y’s tug).

<sup>4</sup> Trading toys and/or sharing in exchange do not code as sharing (e.g., O to Y: “I won’t give you one of my big plates until you give me one of your little plates”).

<sup>5</sup> If the child made an object (e.g., a craft or playdough) or painted a picture, the object and painting belongs to that child.

<b>Comforting</b>	Supportive actions that are intended to alleviate the other’s negative emotional states. Comforting behaviors are emotion-focused rather than being goal-directed <sup>1</sup> .	<p><b>Verbal comforting<sup>2</sup>:</b></p> <p>“It’s ok, you gonna be fine”;</p> <p>“Mom is in the bathroom, she will be back soon”;</p> <p>“It’s nothing serious”;</p> <p>“That’s ok”;</p> <p>“I know it hurts”;</p> <p>“I’m sorry”;</p> <p>Making the sibling laugh with a joke</p> <p><b>Nonverbal comforting:</b></p> <p>Positive contact such as hugging, kissing, patting/ Giving an object to the person in distress when it</p>
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		addresses an emotional need but not a goal-directed need/ Distracting by making others laugh
<p><b>Notes for Comforting:</b></p> <p><sup>1</sup> It should be clarified that instances in which the sibling gives an object to the person in distress (assuming the person’s distress does not reflect a goal to gain access to that particular object) is considered as nonverbal comforting rather than instrumental helping or sharing as it addresses an emotional rather than a goal-directed need.</p> <p><sup>2</sup> If one instance of comforting involves both verbal and nonverbal comforting, the instance is coded twice for each one of the subtypes.</p>		
<b>Protecting</b>	Proactive actions that are intended to prevent others from being hurt. In protecting situations, the incident of hurting has not happened yet and the protector perceives the need. Type of need in protecting is abstract and the recipient may not be aware of the need.	<p><b>Physical protecting:</b></p> <p>Ex: O to Y: “Don’t put your finger in there”—referring to the toy which is like a press and would hurt if a finger got caught in it”</p> <p>Ex: Older sibling grabbed younger sibling’s waist and prevented him from falling from table.</p> <p><b>Psychological protecting:</b></p> <p>Ex: Older sibling came to the defense of younger sibling in front of her mother and father to justify younger sibling’s action (“he didn’t mean to do it!”).</p>