Exploring the Relations Between Helping, Sharing, and Comforting in Childhood Prosocial Development

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Abstract

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Prosociality – i.e., acting to benefit others - is an important part of children's positive development. Despite evidence that children respond to a diversity of needs (e.g., instrumental, material, emotional) in early childhood, different varieties of prosocial behavior frequently do not correlate. This thesis examines prosocial development through the lens of two complementary theoretical perspectives. The *social-cognitive constraint* framework contends that the ability to recognize and respond to diverse needs relies on distinct social-cognitive processes (Dunfield, 2014), suggesting that distinctiveness of responses should decrease as social-cognitive abilities mature. The *motivation-based* framework posits that unique motivations underlie different behaviors (Paulus, 2018), suggesting that responses remain distinct as children age. Despite considerable interest, it remains unclear how the associations between varieties of prosocial behavior change throughout childhood. This study aimed to further examine the interrelatedness of the three subtypes by exploring age-related differences in the associations across need and complexity. Overall, 189 3.5- to 7.5-year-old children participated in six prosocial tasks while parents completed the Childhood Prosocial Assessment questionnaire. Correlations and a principal component analysis provided evidence for partial convergence across subtypes. Three components were identified: 1) Parent-Reported, 2) Instrumental-Comforting, and 3) Costly. Multiple regressions demonstrated that age positively predicted scores on parent-reported and instrumental-comforting. The results suggest that prosocial subtypes are distinct in early childhood but may partially converge with age, highlighting that the social-cognitive constraint account alone cannot fully explain the lack of associations across subtypes. Responding to others' distinct needs must also rely on unique motivations.

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Exploring the relations between helping, sharing, and comforting in childhood prosocial development

Prosocial behavior - acting voluntarily on behalf of another (Hay, 1994) – is a ubiquitous phenomenon that appears early in human ontogeny. Within the first few years of life, children help others complete goal-directed actions (Warneken & Tomasello, 2007), share their resources with others (Rheingold et al., 1976), and comfort others in distress (Zahn-Waxler et al., 1992). As toddlers acquire new skills, these behaviors are performed more frequently and with greater ease (Hay & Cook, 2007). The emergence and subsequent development of prosocial behavior is often associated with many positive interpersonal outcomes, including stronger friendships (Dunn et al., 2002), greater peer acceptance (Caputi et al., 2012), and resilience to bullying (Griese & Buhs, 2014). Additionally, precocious manifestations of prosociality are associated with beneficial developmental outcomes including increased social-emotional competence (Chen et al., 2002) and academic performance (Eisenberg et al., 2015). Considering the importance of prosociality in childhood, encouraging prosocial behavior over the course of development is essential.

Importantly, our ability to promote multiple subtypes of prosocial behaviors (e.g., helping, sharing, comforting) through the creation and implementation of effective prosocial interventions is limited by our understanding of the structure underlying the emergence and subsequent development of prosociality. That is, despite sharing broadly similar underlying mechanisms (i.e., an understanding of others' mental states and other-oriented concerns), prosocial behavior appears to be a heterogeneous construct that encompasses distinct behaviors (Dunfield, 2014; Paulus, 2018). Specifically, subtypes of prosocial behavior do not correlate in early childhood (Dunfield & Kuhlmeier, 2013) and show mixed relations over development (Eisenberg et al., 1999). The aim of the current study is to further examine the interrelatedness of distinct varieties of prosocial behaviors over childhood.

Multidimensionality of Prosocial Behavior

Early in development, children respond to three prototypical varieties of needs – instrumental, material, and emotional - with three varieties of prosocial responses – i.e., helping (Warneken & Tomasello, 2006), sharing (Brownell et al., 2009), and comforting (Zahn-Waxler et al., 1992), respectively (Dunfield, 2014). Yet, despite evidence that all three of these needs motivate prosocial responses early in development (Dunfield et al., 2011), occurrences of

helping, sharing, and comforting appear largely unrelated in early childhood (Dunfield & Kuhlmeier, 2013; Paulus et al., 2015). Engaging in effective prosocial behavior involves: i) recognizing a need in another, ii) identifying the cause and appropriate intervention to alleviate the need, and, iii) critically, the motivation to act on behalf of another to alleviate the negative state (Warneken & Tomasello, 2006). Based on these requirements, two broad theoretical perspectives have been proposed to explain the heterogeneity of early prosocial behavior.

Under the *Social-Cognitive* perspective, early prosocial behaviors can be differentiated based on the need that elicits them (Beier & Dunfield, 2018; Dunfield, 2014). Specifically, children can help in response to an *instrumental need* (i.e., the inability to complete a goal-directed action), share in response to an *unmet material desire* (i.e., an unequal distribution of resources), and comfort in response to *emotional distress* (i.e., inferring negative affect). Because recognizing each type of need relies on the ability to represent and reason about distinct mental states in others (i.e., goals, desires, and emotions, respectively; Dunfield, 2014), each subtype of prosocial behavior shows a unique age of onset: helping first emerges around 14-months of age (Warneken & Tomasello, 2007), sharing around 18-months of age (Rheingold et al., 1976), and comforting around 3- to 4-years of age (Dunfield & Kuhlmeier, 2013).

According to this framework, the lack of associations between subtypes of prosocial behavior can be explained by the distinct social-cognitive constraints imposed by each of the needs (Dunfield, 2014). The social-cognitive constraint account posits that early failures to act prosocially is not due to motivation (e.g., Hepach et al., 2013), but instead the inability to recognize the need and/or identify the appropriate intervention due to immature social-cognitive processes. Consequently, young children may be less likely to respond to some needs (e.g., emotional; Dunfield et al., 2011), and respond inconsistently across subtypes (Dunfield & Kuhlmeier, 2013), because of the varying development of the distinct social-cognitive processes that underlie each type of prosocial response (Dunfield, 2014). In support of this perspective, when Dunfield and Kuhlmeier (2013) assessed 2- to 4-year-old children's responses to distinct needs across multiple prosocial tasks, they found high consistency within tasks assessing the same need, yet no significant correlations between the distinct types of prosocial responses. From this perspective, it is clear that there is heterogeneity in young children's ability to recognize and respond to three distinct needs. Critically, children's ability to recognize needs and act on behalf

of others consistently across prosocial subtypes may depend on the maturation of unique social-cognitive abilities.

Alternatively, the *Motivation-Based* perspective contends that different motivations drive the heterogeneous forms of prosocial behavior (Paulus, 2018). That is, rather than a general motivation to alleviate the negative state in others, unique underlying motivations predict the emergence and subsequent development of distinct prosocial responses. Children may be motivated to respond to *help* out of concern for what others want, *share* out of concern for doing the right thing, and *comfort* out of concern for a distressed other (Davidov et al., 2016; Paulus, 2014). Therefore, young children may respond inconsistently across subtypes because of the varying motivational mechanisms that underlie each type of prosocial response (Paulus, 2014; Paulus, 2018). From this theoretical framework, motivations may also change as children age and begin to internalize the normative rules of their environment (Dahl & Paulus, 2019). For example, Dahl and Paulus (2019) argued that early instances of helping may arise from a motivation to engage in joint activity and/or to see others' goals achieved. By the end of toddlerhood, children become more attuned to others' emotional states and may then be motivated by empathic concern. Finally, by mid-childhood, children act on behalf of others as they are motivated to act in accordance with their normative views (Dahl & Paulus, 2019). Nonetheless, children may still be less likely to respond to some needs as normative considerations may motivate certain responses (e.g., sharing) more than others (e.g., comforting; Paulus, 2018). Simultaneously, certain motivational mechanisms underlie all three types of responses, such as social affiliation, empathic concern, and normative considerations (Paulus, 2018). Nonetheless, Paulus (2018) argued that the motivations are not mutually exclusive, and certain responses may simply draw on one motivation more than another. From this perspective, the heterogeneity in children's responses across subtypes are due to distinct motivations. Critically, children's motivation to respond to distinct needs may change throughout development.

Together, it is clear that early prosociality is formed by a group of diverse prosocial responses to distinct needs. In early childhood, inconsistency of responding across subtypes may be explained by unique social-cognitive processes underlying children's ability to recognize and respond to distinct needs. Alternatively, children may respond inconsistently across subtypes due to specific underlying motivations. An open question is whether these prototypical prosocial

responses remain unrelated as children age. From a social-cognitive perspective, responses to each need should converge as children age and social-cognitive abilities mature. From a motivation-based perspective, even as children age responses to each need should remain distinct to the extent that motivations underlying each type of response remain distinct. Previous research has explored both the unique social-cognitive abilities and motivations underlying children's various prosocial responses.

Development of Supporting Social-Cognitive Processes and Motivations

Responding to Instrumental Need

Helping requires the ability to recognize and respond to an instrumental need. The ability to recognize an instrumental need requires an understanding of others' goal-directed action. Previous research has suggested that infants possess both an understanding of other's goal-directed behavior (Woodward, 1998) and of others' intentional action (Behne et al., 2005; Meltzoff, 1995) within the first year of life. By 15-months-old, infants' joint attentional skills - the ability to coordinate attention with that of a social partner – is related to their responses to instrumental need (Kärtner et al., 2014). Therefore, within the first two-years of life, children have the social-cognitive skills required to represent others' goals.

In addition to the ability to recognize an instrumental need, young children appear to be highly motivated to see others' goals achieved (Paulus, 2018). As previously mentioned, Dahl and Paulus (2019) argued that early helping behavior was primarily driven by an interest in social interactions. In support of this claim, infants seem to use their understanding of goal-directed action to socially evaluate individuals, showing a preference for individuals who help, rather than hinder, another individual complete their goal (Hamlin et al., 2007). Furthermore, Dahl et al. (2017) found that 15-month-old infants who received explicit scaffolding (e.g., praise, encouragement) helped more in subsequent tasks than infants in a control group, suggesting children who received scaffolding were motivated to socially engage with others (but see Warneken & Tomasello, 2008 who argue against the need for extrinsic rewards). However, scaffolding no longer influenced infants helping behavior at 18-months of age (Dahl et al., 2017), suggesting a change in children's motivation. Dahl and Paulus (2019) proposed that by 2-years of age, children are motivated by a desire to see others' goals achieved. Relatedly, Hepach et al. (2012) found that 2-year-olds were intrinsically motivated to see others helped, regardless of who did the helping. Specifically, they measured children's sympathetic nervous system arousal in

response to an adult's incomplete goal and found that children's arousal decreased when the actor received help, regardless of whether the help was provided by them or by a third-party (Hepach et al., 2012). In a follow-up study, Hepach et al. (2023) found that in comparison to 2-year-olds, 5-year-olds showed more positive emotions (as measured by postural elevation) when they helped than when a third party did (Hepach et al., 2023). Again, this is consistent with Dahl and Paulus's (2019) claim; specifically, the motivations underlying helping behavior change throughout development. Therefore, early helping may be motivated both by social affiliation and a desire to see other's goals achieved, whereas later in childhood, instrumental helping may be driven by different motivations.

Taken together, an understanding of goals and goal-directed action are early emerging social-cognitive abilities that support children's ability to recognize others' instrumental need (Köster et al., 2016). Within the first two-years of life, children are also motivated to interact with others and see their goals achieved (Dahl & Paulus, 2019). As a result of the early development of these social-cognitive processes and motivations, it is not surprising that young children respond to instrumental need earlier (i.e., 14-months of age; Warneken & Tomasello, 2007) and more frequently than they respond to both material desire and emotional distress.

Responding to Material Desire

Sharing requires the ability to recognize and respond to an unmet material desire. The ability to recognize unmet material desire requires an understanding of an unequal distribution of resources, and the ability to inhibit the desire to monopolize resources. Equity expectations seem to appear early in ontogeny; specifically, within the first two-years of life, young children have expectations regarding an equal distribution of resources between recipients (Schmidt & Sommerville, 2011). Using a looking-time paradigm, infants as young as 15-months-old are sensitive to the fairness of a resource distribution and expect resources to be divided equally (Schmidt & Sommerville, 2011; Sommerville et al., 2013). Infants also use their understanding of fairness to socially evaluate individuals; Geraci and Surian (2011) found that 16-month-old children looked longer at individuals who approached an agent that was previously fair in their resource distribution rather than one that was previously unfair. Therefore, within their second-year, children are sensitive to a fair distribution of resources.

Consequently, a key motivational mechanism underlying children's sharing behavior is children's fairness expectations (Davidov et al., 2016; Paulus, 2014). By 3-years-old, children

recognize and respond negatively to an unequal distribution of resources (LoBue et al., 2011). Relatedly, Rakoczy et al. (2016) found that young children not only recognize an unequal distribution of resources but will protest against unfair recipient outcomes in both first- and third-party interactions. Finally, Smith et al. (2013) found that 3-year-olds stated they should share stickers equally, suggesting that children at this age have internalized the rules of their environment (Paulus, 2014). Therefore, by 3-years-old, children can recognize and respond negatively to unmet material desire.

However, recognizing a need and possessing a normative understanding of fairness alone are insufficient for sharing behavior. That is, there is a gap between young children's understanding of fairness principles and their actual sharing behavior (Blake et al., 2014). For example, Smith et al. (2013) found that 3- to 8-year-old children readily endorsed a norm for fairness, stating that if given a set of stickers, they should share the stickers equally with another child. However, when children were actually given the opportunity to share, only the 7- to 8-year-olds shared equally. That is, despite having previously endorsed a norm for fairness, 3- to 5-year-old children selected distributions of stickers that favored themselves (Smith et al., 2013). This suggests that in addition to recognizing and responding to unmet material desire, additional abilities are required for children to respond to the need.

Broadly, children must be able to represent what constitutes an equal distribution of resources. Consequently, children's numerical cognition (i.e., counting proficiency) has been found to predict children's sharing behavior (Chernyak et al., 2019; Sohail et al., 2022). In one study, Sohail et al. (2022) found that 3- to-6-year-olds' numerical cognition uniquely predicted equal sharing, but not helping, behavior. Moreover, children who participated in a counting intervention showed subsequent improvements in their fair sharing behavior (Chernyak et al., 2022). Critically, Chernyak et al. (2019) found that numerical cognition is not related to children's normative knowledge of equality; rather, children's understanding of a fair distribution of resources emerges before their ability to act on their conceptual knowledge. This suggests that the limiting factor in responding to unmet material desire is not from a lack of motivation, but rather, the ability to numerically represent an equal distribution of resources.

Furthermore, children must overcome their own desire to keep a resource in order to act on behalf of another. As a result, the role of executive function (EF) – a set of deliberate mental processes involved in the control of thought, action, and emotion (Zelazo et al., 2013) – has been

explored in relation to sharing behavior. Researchers have found that greater inhibitory control (i.e., a core construct of EF) is associated to sharing behavior in both preschool-aged (Aguilar-Pardo et al., 2013; Traverso et al., 2020) and school-aged children (Steinbeis, 2018). In support of the essential role inhibitory control plays in children's sharing behavior, Steinbeis and Over (2017) conducted a study with 6- to 9-year-old children in which they directly manipulated behavioral inhibitory control (i.e., self-control) prior to a sharing task. They found that children who listened to a story promoting behavioral control subsequently shared more with another child than children who listened to a neutral story. This suggests that children's ability to respond to others' material desire depends in part on the ability to regulate their own behavior.

Taken together, both the representation of the need and the motivation to act make responding to unmet material desire especially difficult for young children. Although children can respond to others' unmet material desire by 2-years-old, studies have found that early sharing is facilitated by making an explicit non-verbal request (e.g., extending a hand with a palm out; Dunfield et al., 2011) or verbalizing one's desires (Brownell et al., 2009). Without these explicit cues - and regardless of motivation - representing others' material desire and responding to the need by engaging in sharing behavior requires unique and mature social-cognitive abilities (e.g., numerical cognition, inhibitory control) that develop later in childhood.

Responding to Emotional Distress

Comforting requires the ability to recognize and respond to others' emotional distress. The ability to recognize and respond to others' emotional distress requires an understanding of others' internal states, as well as the ability to regulate one's own emotional response and differentiate self from other. Infants as young as 7-months of age have a basic understanding of the emotions of others', matching facial expressions and vocal output based on common affective information (Grossman, 2010). By approximately 3-years-old, children can recognize and name both positive emotions (e.g., happiness) and negative emotions (e.g., fear, anger, and sadness) on the basis of expressive cues (Pons et al., 2004). Although a basic understanding of others' emotions may be important for recognizing emotional distress, Vaish and colleagues (2009) found that children as young as 18-months of age showed concern for others' for whom they previously witnessed was involved in a hurtful situation, even when the victim did not display overt emotional expressions. This suggests that children can represent emotional distress in the absence of outward facial expressions.

A prominent theory regarding other-oriented concern includes Hoffman's (2007) four-stage model on the development of empathic concern. In this model, signs of empathic concern appear early in infancy through a phenomenon coined *emotion contagion* (i.e., newborns cry at the sound of another infant crying). As children begin to regulate their own emotional experiences and develop a sense of self, they are able to engage empathically towards others' distress (Hoffman, 2007). In support of this theory, Zahn-Waxler et al. (1992) found that 2-year-old children with a more developed sense of self-awareness and self-other differentiation showed greater expression of concern towards others' distress.

As Hoffman (2007) proposed, children's empathic responsiveness within the first-year of life is primarily driven by emotional contagion. As children develop a sense-of-self, empathic responsiveness to others' distress emerges (Dahl & Paulus, 2019). Empathic concern has frequently been proposed as the primary motivation in comforting behavior specifically, and prosociality more generally (Paulus, 2018). Various studies have demonstrated that empathic concern is linked to children's responses to others' emotional distress (Eisenberg et al., 2015). Specifically, children recognize others' emotional distress which activates their empathic concern. In turn, children are motivated to respond to others' emotional distress by engaging in comforting behavior (Paulus, 2018).

However, responding to others' emotional distress also requires mature perspective-taking skills, including the ability to infer others' thoughts and beliefs (i.e., cognitive perspective-taking; Eisenberg et al., 2015) and to infer others' emotions and feelings (i.e., affective perspective-taking; Denham, 1986; Hoffman, 2007). From 2-years of age, children attempt to understand others' distress through a process called hypothesis testing (Eisenberg et al., 2015). However, a cognitive understanding of others' distress alone does not lead to prosocial responding. Critically, children's affective perspective-taking is associated with spontaneous response to need (Knafo et al., 2011). Therefore, a prerequisite to comforting behavior includes the ability to infer others' internal emotional states.

Additionally, children have to recognize the cause of an others' emotional state and consequently, the intervention required to alleviate the negative state. This may be especially hard for young children, who have yet to fully develop an understanding of the internal states of others. In support of this idea, Svetlova et al. (2010) found that toddlers engaged in more comforting behavior when they were given explicit cues, suggesting that young children are not

necessarily less motivated to act on behalf of another, but may fail to spontaneously recognize the cause of others' distress. Additionally, Dunfield and Kuhlmeier (2013) found that 2- to 3-year-old children were more likely to respond to emotional distress that was the result of an instrumental cause than emotional distress that was the result of injury, suggesting that children at this age have an easier time identifying and responding to certain needs than others. Researchers have found that by approximately 3- to 4-years of age, children have an understanding of the causes underlying others' emotional states and are able to accurately identify others' emotional responses based on contextual cues (Borke, 1971; Pons et al., 2004). This milestone presumably develops in conjunction with supporting social-cognitive abilities (Fabes et al., 1991), allowing older children to accurately represent others' emotional distress and identify the appropriate intervention to alleviate the negative state.

To highlight the critical role that emotion and internal mental state understanding plays in the development of comforting behavior, several studies have found that parents who engage in greater emotion and mental state discourse have toddlers who engage in more comforting behavior (Brownell et al., 2013; Drummond et al., 2014). Additionally, neither Brownell et al. (2013) nor Drummond et al. (2014) found significant associations between emotion/mental state discourse and children's instrumental helping behavior, providing further evidence for the unique social-cognitive abilities underlying the development of comforting behavior.

Taken together, the ability to recognize and respond to others' emotional distress may be especially challenging for young children who have yet to fully develop an understanding of others' internal states. Additionally, empathic concern may motivate children to engage in comforting behavior, but empathic concern requires mature perspective-taking abilities (Eisenberg et al., 2015). Consequently, children's ability to respond to others' emotional distress appears around 3- to- 4-years of age (Dunfield & Kuhlemeier, 2013) when supporting social-cognitive abilities have presumably emerged.

Do Relations Between Subtypes Change with Age?

The emergence and subsequent development of prosociality is a complex phenomenon - a multitude of unique underlying social-cognitive abilities and motivations are related to each distinct subtype of prosocial behavior. However, it remains unclear whether these prototypical prosocial responses remain unrelated as children age.

From a social-cognitive perspective, early dissociations across prosocial subtypes should converge as children's social-cognitive abilities mature. There is some limited work suggesting partial convergence between subtypes in older children. Specifically, a recent longitudinal study explored the consistency of individual differences in prosocial behavior using both a variable-centered and person-centered analysis. In both of the analyses, the authors found consistency in responding across subtypes when children were assessed at 4.5-years-old, and again a year-and-a-half later (Schachner et al., 2018). That is, children were grouped into prosocial groups (e.g., low vs. high prosocial) based on their responses across various prosocial tasks. This suggests that prosocial behavior may reflect a dispositional core, but we do not see relations across subtypes in early childhood due to developing social-cognitive abilities. However, these diverse findings may reflect methodology; specifically, Schachner and colleagues' (2018) person-centered analyses did not take the specific varieties of needs into account.

Recently, Paz et al. (2023) conducted a longitudinal study with 18-month-olds to explore the consistency across subtypes over time. They administered a battery of behavioral tasks assessing responses to distinct needs at 18-months and 36-months. When they modelled the relations between the three subtypes, they found evidence for partial convergence at both ages. Specifically, they found support for a two-factor model: scores on the helping and comforting tasks formed a factor they labelled *Instru-Compassionate* while scores on the sharing task formed a factor they labelled *Sharing*. Yet because of the young age of Paz et al.'s (2023) sample, it remains unclear what these associations will look like in an older sample.

From a motivation-based perspective, prosocial subtypes should remain distinct over development as they are driven by unique and changing motivations. However, there is some evidence to support the stability of individual differences in prosocial behavior over time (Eisenberg et al., 1999), as well as a general prosocial personality factor in older children (Knafo-Noam et al., 2015). This suggests that despite unique motivations underlying the behaviors, children may possess a global motivation to engage prosocially with others. Although the basis of this motivation has yet to be determined, Paulus (2018) proposes that children may develop a self-concept that reflects acting on behalf of others. To date, much of the research that could inform the changing relations between prosocial behaviors has been conducted with young children (e.g., Dunfield & Kuhlmeier, 2013) or adolescents (e.g., Eisenberg et al., 1999) leaving

absent important observations in middle childhood - a period in which substantial changes in social-cognition and social relationships occurs.

Indeed, only a handful of studies have directly compared children's responses to instrumental need, material desire, and emotional distress in both infancy (Dunfield et al., 2011; Paz et al., 2023) and early-to-mid childhood (e.g., Dunfield & Kuhlmeier, 2013; Schachner et al., 2018). Moreover, studies that have examined children's responses to multiple distinct needs have found evidence for unique social-cognitive abilities that predict different rates of responding to each type of need (Chernyak et al., 2019; Dunfield & Johnson, 2015; Kärtner et al., 2014; Schuhmacher at al., 2017; Sohail et al., 2022; Malti et al., 2016; Paulus et al., 2013). Finally, several intervention-based studies have found that targeting unique social-cognitive skills predicts increased responding for each distinct type of need (Brazzelli et al., 2021; Brownell et al., 2013; Chernyak et al., 2022; Drummond et al., 2014; Steinbeis & Over, 2017). Therefore, examining children's responses to each type of need from a social-cognitive framework allows for stronger claims to be made regarding the age-related differences in the associations across prosocial subtypes.

Present Study

The developmental trajectory of prosociality and the structure underlying the inconsistency of responding across subtypes remain unclear. To further understand the relations between the three subtypes across childhood, this study aimed to build on Dunfield and Kuhlmeier's (2013) previous work by studying a large age-range (i.e., 3.5- to 7.5-year-olds) and administering two prosocial tasks per subtype that differed in their costliness and cognitive complexity. Specifically, we administered three *simple prosocial tasks* drawn from Dunfield et al. (2011). In these tasks, a single need was expressed, and the intervention required was explicit. We also administered three *complex prosocial tasks*. In these tasks, the representation of the need was more ambiguous and required more mature perspective-taking abilities to determine the appropriate intervention. Moreover, we aimed to explore age-related differences in the interrelatedness of prosocial behaviors across subtype (i.e., helping, sharing, comforting) and across task complexity (i.e., simple versus complex).

A parent-report measure was also administered to obtain a subjective measure of children's prosociality. Parents have a broader understanding of their children's prosocial behavior than what can be determined through laboratory-based experiments. Additionally,

studies have suggested that parents can differentiate between prosocial subtypes in their responses (Giner Torréns & Kärtner, 2017). Therefore, we believed including a parent-report measure would provide additional information regarding the relations across subtypes.

Hypotheses

Based on the social-cognitive constraint account, we expected to find age-related differences in the relationship between prosocial subtypes. Specifically, we expected to see an increase in prosocial responding and greater relatedness between prosocial subtypes among the older children in our sample (i.e., > 5.5 years-old). At this age, supporting social-cognitive processes, such as an understanding of others' internal states (Wellman & Liu, 2004), inhibitory control (Zelazo et al., 2013), numerical cognition (Chernyak et al., 2019), and emotion comprehension (Pons et al., 2004) are well developed.

Associations Across Age and Simple Prosocial Behaviors. We expected to replicate Dunfield and Kuhlmeier's (2013) findings regarding the lack of relations between the three types of prosocial responses in the simple tasks among the younger children in our sample (i.e., <5.5 years-old). Due to developed social-cognitive abilities and the simplicity of the tasks, we expected to find cross-task correlations across all three subtypes in the older age group (i.e., >5.5 years-old). Consistent with Dunfield and Kuhlemeier's (2013) findings, we also expected to find higher correlations among the helping and comforting tasks than the sharing task, as the interventions required in the simple helping and comforting tasks were both largely instrumental.

Associations Across Age and Complex Prosocial Behaviors. Due to the increased complexity and cognitive-demands of these prosocial tasks, we expected to find low rates of prosocial responding and no cross-task correlations in the complex tasks in the younger age group. In comparison, we expected to find cross-task correlations in the complex tasks in the older age group. Children at this age should possess the ability to recognize a complex need, identify the appropriate intervention, and be motivated to alleviate the need in another.

Associations Across Task Complexity. As the needs expressed were more complex and identifying the appropriate intervention required more mature social-cognitive abilities, we expected to find no correlations across task-complexity (i.e., from simple to complex) in the younger age group. Consistent with previous literature (e.g., Dunfield & Kuhlmeier, 2013), behaviors that respond to the same need will likely associate. Therefore, once social-cognitive abilities are in place, we expected to find correlations among each subtype across task complexity

in the older age group. For example, we expected to find a strong association between the simple sharing task and the complex sharing task, as the need expressed (i.e., material desire) and the most appropriate response (i.e., sharing) were the same in both tasks. We also expected to find a strong association between the simple comforting task and the complex comforting task in the older age group - even though the interventions differed (i.e., instrumental vs. affective) - as older children should have a more developed understanding of others' emotions and internal states. In comparison to the simple task, the required intervention in the complex helping task was more ambiguous. While the predicted association across task complexity assessing helping behavior was unclear, we did expect to see an association between the simple helping task and the complex helping task, as they both required behaviors that respond to the same need.

Heterogeneity of Subtypes Across Childhood. We aimed to take an omnibus approach to explore the influence of age on the relations between subtypes, conducting both a correlation analysis and a principal component analysis. Although previous studies have modelled the three subtypes in early childhood (Paz et al., 2023), it was unclear how the relationship between helping, sharing, and comforting would change as children aged. Specifically, if prosocial behavior is a stable individual difference, we expected to see high correlations across measures once social-cognitive abilities are in place. Subsequently, we expected that a 1-component model (i.e., with a global Prosociality component) would fit the data best in the older age group. If, however, we did not find any age-related differences in the correlations across measures, this would lend credence to the idea that prosocial behavior remains a heterogeneous group of behaviors across development. That is, even when social-cognitive abilities are in place, unique underlying processes (e.g., motivation) may lead to different rates of responding across subtypes. Consequently, it was possible a 3-component model (i.e., with Helping, Sharing, and Comforting as distinct components) would best represent the relations between subtypes in early-to-late childhood.

Method

Participants

Overall, 189 3.5- to 7.5-year-old children participated in the study. Participants were recruited from eight half-year age brackets in order to ensure an approximately equal distribution of children in four 1-year age groups: 3.5- to 4.5-year-olds (N = 50, M_{age} = 47.4 months, 52% girls), 4.5- to 5.5-year-olds (N = 50, M_{age} = 59.2 months , 50% girls), 5.5- to 6.5-year-olds (N = 49, M_{age} = 71.3 months, 51% girls), and 6.5- to 7.5-year-olds (N = 40, M_{age} = 82.8 months, 60% girls).

Parents listed their child's ethnic background as Caucasian/White (42.9%), Black (6.9%), East Asian (4.2%), South Asian (3.2%), Southeast Asian (4.8%), West Asian (3.7%), Latin American (1.1%), Indigenous (0.5%), or as a combination of ethnic backgrounds (34.9%). Two parents did not provide an answer. Mothers were frequently identified as the primary caregiver (91.5%) and the primary caregiver reported 17.8-years of education on average. Parents reported an average annual net income of $125 000 (range = 480 000), although 28 parents did not provide an answer. Participants in the sample had 0 to 4 siblings (M = 1.3 siblings).

Participants received a small gift and a certificate of participation. Parents were compensated a $10 gift card for their time. This research study was conducted as part of a larger, international, multi-institutional Open Research Area (ORA) research project that included additional behavioral measures and questionnaire data not reported here.

Procedure

Testing occurred in the CSCD laboratory at Concordia University. The study took approximately 90 minutes to complete. The prosocial tasks were interspersed between other social-cognitive tasks that were part of the larger study. Three complex prosocial tasks were conducted at the start of the experiment and three simple prosocial tasks were conducted at the end of the experiment.

Children and parents were initially brought to a waiting room in the laboratory. Parents received informed consent while children familiarized themselves with the experimenter and the environment. Children were then brought into the testing room while parents remained in the waiting room. Five of the prosocial tasks were conducted at a small table in the middle of the testing room. One prosocial task was conducted at a computer in the corner of the testing room. Participants were presented with six prosocial opportunities. For each of the three prosocial

behaviors we aimed to measure (i.e., Helping, Sharing, Comforting), two tasks were administered that differed on their complexity (i.e., Simple tasks/Complex tasks). Parents were also asked to complete a demographics questionnaire and the Childhood Prosocial Assessment (CPA) while their child was in the testing room.

Simple Tasks

The three simple prosocial behavior tasks were drawn from Dunfield et al. (2011) and conducted with minor variations. Participants observed the experimenter experience *instrumental need* (Blocked Door task), *material desire* (Unequal Stickers task), and *emotional distress* (Broken Teddy task). The tasks were conducted at the end of the experiment and presented in a fixed order: Unequal Stickers, Broken Teddy, Blocked Door. The cues delivered in the simple tasks followed a similar communicative cue structure to the one proposed by Svetlova et al. (2010) and increased in their explicitness throughout the duration of the trial.

Blocked Door. In this task, the experimenter picked up several boxes and walked towards the door to exit the room. The experimenter pretended that the boxes were very heavy and struggled to free a hand to open the door. Cues were delivered every 5s to make the experimenter's instrumental need increasingly salient (see Appendix A). The trial started at the first cue (i.e., the experimenter attempted to open the door with their foot or elbow) and ended when the participant opened the door, or 5s after the last cue was delivered (i.e., "Can you help me open the door?"), for a total trial time of 35s.

Unequal Stickers. In this task, the experimenter took out two closed boxes and handed one to the participant. The participant's box contained four stickers and the experimenter's box contained no stickers. The experimenter pretended to be sad to see the contents of their box. Cues were delivered every 5s to make the experimenter's material desire increasingly salient (see Appendix B). The trial started at the first cue (i.e., experimenter said "Look what I have" in a sad tone) and ended when the participant shared their stickers, or 5s after the last cue was delivered (i.e., "Can you share your stickers?"), for a total trial time of 35s.

Broken Teddy. In this task, the experimenter presented their favourite teddy bear to the participant. When the experimenter started to play with the teddy bear, its arm fell off. The experimenter pretended to be surprised, then sad to see the broken teddy. Cues were delivered every 5s to make the experimenter's emotional distress increasingly salient (see Appendix C). The trial started at the first cue (i.e., experimenter was surprised and said, "Oh no!") and ended

when the participant comforted the experimenter, or 5s after the last cue was delivered (i.e., "Can you make me feel better?"), for a total trial time of 35s.

Complex Tasks

In the three complex prosocial tasks, the costliness of engaging in a prosocial response and the cognitive complexity of the need expressed were increased. The tasks were conducted at the start of the experiment and presented in a fixed order: Mini-Dictator, Auditory Helping, Pain Simulation.

Auditory Helping. This task was adapted from Hoffman et al.'s (2015, 2021) costly gustatory helping task. In this task, participants were told they would be playing a computer game with another child (i.e., a gender-neutral child confederate) in another room. The participants were shown a pre-recorded video of their game partner and were informed that they could see their partner but that their partner could not see them. Participants were then introduced to aversive sounds and were made to believe that in subsequent rounds of the game, either they themselves or their partner would need to listen to additional aversive sounds, depending on the card they drew from a deck of cards. The cards were rigged so that the participant always selected the card that indicated their partner would need to listen to the sounds. However, participants were told that there was a "special rule" in the game in that they could decide to listen to an aversive sound in their partner's place. Specifically, during each trial, participants could select between two buttons: one button allowed the participant to watch a video while their partner listened to the aversive sound, and the other button allowed the participant to listen to the aversive sound on behalf of their partner.

This task included two rounds of five trials. In the first round of the task (i.e., the No Escape condition), participants had to watch a pre-recorded video of their partner listening to the aversive sounds if they did not select the button to listen to the sound on behalf of their partner. In the second round of the task (i.e., the Escape condition), participants watched videos of landscapes if they did not select the button to listen to the sound on behalf of their partner (see Appendix D for stimuli).

Mini-Dictator. This task was adapted from Fehr et al.'s (2008) mini-dictator game. In this task, participants were told that they could win stickers for themselves and for another child, who was unable to come to the laboratory. Participants were asked to select between two cards

that presented two unique distributions of stickers by placing the card they wanted on a happy face, and the card they did not want on a sad face (see Appendix E for stimuli).

Cost and privacy were manipulated to create four rounds of the game: private/costly, public/costly, private/non-costly, public/non-costly. Each round included three trials. In costly-sharing trials, participants could select between a card that granted them two stickers and no stickers for the other child (2:0) or a card that split the stickers equally between themselves and the other child (1:1). In the non-costly trials, participants could select between a card that split stickers equally between themselves and the other child (1:1) or a card that granted them one sticker and placed the other sticker back in a sticker supply (1:0). In private trials, the experimenter turned around and closed their eyes while the participant made their choice. In public trials, the experimenter watched as the participant made their choice.

Pain Simulation. This task was adapted from Bandstra et al. (2011). In this task, the experimenter pretended to accidentally pinch their finger in a clipboard. The pain simulation lasted 1-minute, whereby the experimenter displayed pain at pinching their finger for the first 30s and gradually lessened their distress for the next 30s. Cues were delivered every 10s (see Appendix F).

Parent-Report Measure of Prosocial Behavior

The CPA is a 12-item parent-report questionnaire that aims to assess prosocial behavior in childhood by asking parents to rate how frequently they have seen their child engage in a particular behavior on a 5-point Likert scale (1 = *Never*, 5 = *Always*), with the additional option of '*Not Seen*' (see Appendix G). Items aim to distinctly assess helping, sharing, and comforting behavior. For example, "*My child will give me some of their food if I say I like that food*" and "*My child will try to console another child who is worried or afraid*." The questionnaire administered in this study was a shortened iteration of previous version and aims to be validated using data from the larger multi-institutional research project. The CPA was initially developed by Dr. Kristen Dunfield and Astrid Kleis.

Plan of Analysis

Data Reduction

Simple Tasks. The simple prosocial tasks were coded following the same coding scheme. Participants initially received a score of 0-7 for each task according to the cue at which they provided aid to the experimenter, with a higher score indicating earlier aid with fewer cues.

Scores were then transformed to a four-point scale for the purposes of the analysis to reflect participants understanding of the need expressed, with 0 = *no prosocial behavior*, 1 = *compliant prosocial behavior* (provided aid after direct request), 2 = *cued prosocial behavior* (provided aid after need was made explicit and/or when experimenter made eye-contact), 3 = *spontaneous prosocial behavior*. Videos were coded by a trained research assistant, and inter-rater reliability was calculated for 20% of the videos ($k_{\text{helping}} = 0.957$; $k_{\text{sharing}} = 0.991$; $k_{\text{comforting}} = 0.997$). The first 27 cases of the Unequal Stickers task and the Broken Teddy task were excluded from the analysis as children did not receive ordinal cues. Additional cases were excluded from the analysis if the experimenter deviated from the script, or if there was interference from the parent or participant (e.g., the parent opened the door in the simple helping task).

Complex Tasks. As the nature of the no escape trials resembles most the format of the simple tasks (i.e., in the simple tasks, participants are directly interacting with the experimenter), only the No Escape block of trials for the Auditory Helping task were included in the analysis. Trials were excluded if participants' reaction time was less than 100ms and/or greater than 3 SD's of their mean reaction time. A Helping score was then generated based on the proportion of eligible trials participants opted for the prosocial option. Participants received a score of 1 if they always chose the prosocial option, and a score of 0 if they never chose the prosocial option.

As the nature of the public/costly trials resembles most the format of the simple sharing task (i.e., in the simple sharing task, it is costly to the participant to give their stickers to the experimenter and the experimenter can see their choice), only the Public/Costly condition trials for the Mini-Dictator game were included in the analysis. Trials were excluded if participants did not make a choice. A Sharing score was then generated based on the proportion of eligible trials participant opted for the prosocial option. Participants received a score of 1 if they always chose the prosocial option, and a score of 0 if they never chose the prosocial option.

The Pain Simulation was coded using the Empathic Concern coding scheme (see Appendix H). For the purpose of the analysis, only the coder ratings for the Prosocial Acts scale were used. Participants were scored on a four-point scale, with a higher score indicating more complex prosocial behavior. Scores ranged from 0 to 3, with 0 = *no prosocial behavior*, 1 = *mild prosocial behavior* (e.g., sharing own experience with pain), 2 = *moderate prosocial behavior* (e.g., providing instrumental help), 3 = *strong prosocial behavior* (e.g., physically comforting experimenter). Videos were coded by a trained research assistant, and inter-rater reliability was

calculated for 20% of the videos (ICC = 0.93). If the pain simulation was less than 45s or the experimenter deviated from the script, the data was excluded from the analysis.

Parent-Report Measure. The CPA is still in the process of being validated. For the purposes of this analysis, responses listed as *'Not Seen'* were treated as missing data, and a mean score was then generated for the Helping, Sharing, and Comforting items. Participants received a score from 1 to 5 for each of the subscales. Cronbach's alpha coefficients were calculated to determine the reliability and internal consistency of the Helping, Sharing, and Comforting scale. Results indicated that the Helping scale and the Sharing scale had poor reliability and internal consistency (Cronbach's alpha coefficient = .431; Cronbach's alpha coefficient = .570). The Comforting scale had acceptable reliability and internal consistency (Cronbach's alpha coefficient = .754).

Planned Analyses

We conducted a correlation analysis to explore the associations across age, subtype, and task complexity. As some of the behavioral measures violated the linearity and normality assumptions of the Pearson-correlation, and due to the nature of our variables (i.e., combination of ordinal and continuous scales), we conducted the correlation analyses using the Spearman rank correlation coefficient - a non-parametric test that is a more robust correlational method (Watkins, 2018). The correlation analysis was conducted using data from the entire sample (i.e., 3.5- to 7.5-year-old's), and then repeated exploring the associations in the younger sample (i.e., 3.5- to 5.5-year-old's) versus the older sample (i.e., 5.5- to 7.5-year-old's).

We aimed to further explore the patterns of associations between subtypes across childhood by examining the component structure of the underlying variables. As the nature of the model was relatively exploratory, and we aimed to reduce the data into meaningful categories, we conducted an Exploratory Factor Analysis (EFA) using principal component analysis with varimax rotation. Helping, sharing, and comforting were each estimated by two observed scores (i.e., score on the simple task and score on the complex task) and the parent-report measure. Bartlett's test of sphericity (Bartlett, 1954) was used to assess adequate correlations across the variables and the Kaiser-Meyer-Olkin (KMO; Kaiser, 1974) statistic was used to determine sampling adequacy. A minimum KMO value of .50 was required to conduct the analysis (Watkins, 2018). Once the components were obtained, we conducted Multiple Linear regressions

on each of the components using Age and Gender as predictor variables. All analyses were conducted in IBM SPSS Statistics version 28.0

Results

Data Integrity

Two children were tested but not included in the final sample as they did not complete any of the behavioral measures. Additionally, eight parents did not complete the CPA.

Missing observations were then evaluated for the behavioral measures. Data loss across the six measures was observed (range = 1.6% - 15.0%). In addition to determining the amount of missing data, we aimed to evaluate the patterns of missingness. As Schlomer et al. (2010) recommends, we created a dummy binary variable for each of the variables (0 = *no missing data*; 1 = *missing data*) and conducted a bivariate correlation analysis. We found a statistically significant negative correlation between age and missing data for the Auditory Helping task (r_s = -.27) and the Mini-Dictator game (r_s= -.15). Due to the exclusion of the first 27 cases of the Unequal Stickers task and the Broken Teddy task, missing data for these two variables was related (r_s = .85) Moreover, missing data on the complex tasks were related; specifically, missing data on the Auditory Helping task was related to missing data on the Mini-Dictator game (r_s = .33) and the Pain Simulation (r_s = .16), and missing data on the Mini-Dictator game was related to missing data on the Pain Simulation (r_s = .40). These patterns suggested that the missing data was not missing completely at random (MCAR) and was either missing at random (MAR) or not missing at random (NMAR; Schlomer et al., 2010). As the majority of missing data can be accounted for by task-specific exclusion criteria, such as missing ordinal cues, experimenter error or task incompletion, we treated the missing data as MAR (Tabachnick & Fidell, 2012). To retain the maximum amount of data, pairwise deletion was used when analyses contained missing data in the correlation analyses. However, listwise deletion was used when analyses contained missing data in the principal component analysis.

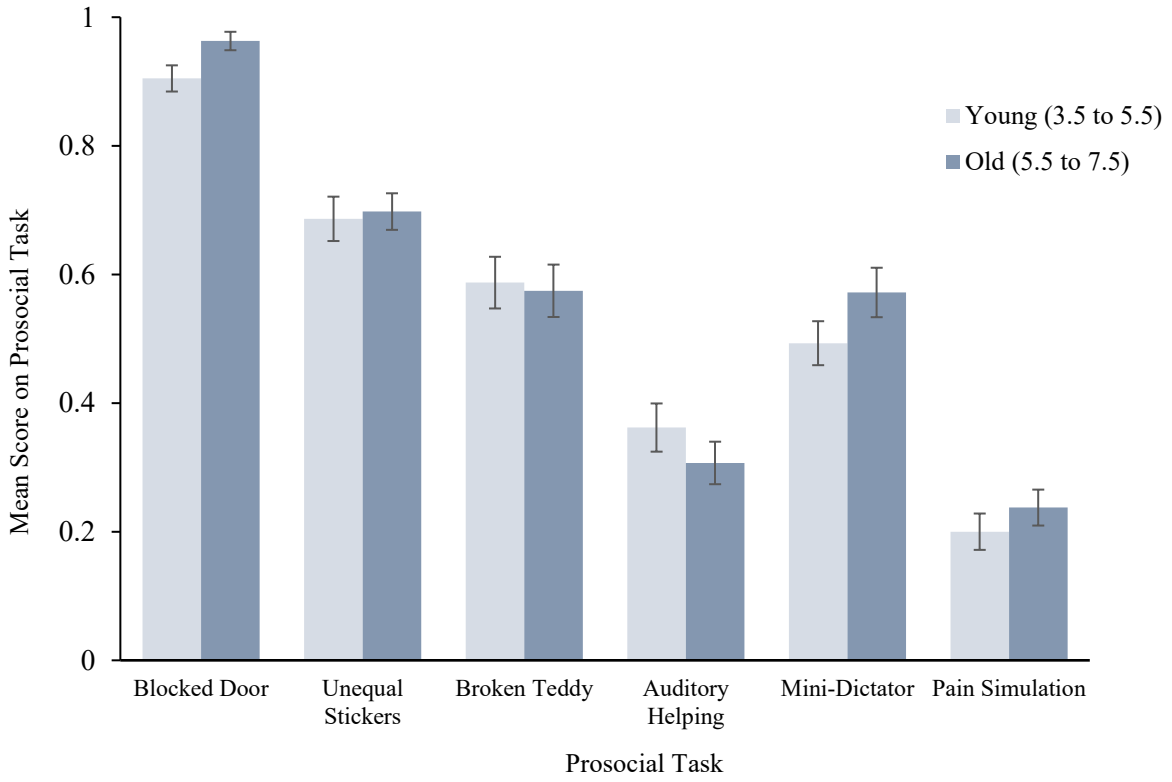
Descriptive Statistics

Several items from the demographic questionnaire were examined as potential control variables (e.g., primary caregiver education (in years), net annual income, number of siblings). None of the prosocial behavior measures were significantly associated with the demographic variables, including: primary caregiver education (r_s between -.13 and .08), net annual income (r_s between -.05 and .09), and number of siblings (r_s between -.10 and .11). We also examined

whether children's gender (binary: 0 = *boy*, 1 = *girl*) was significantly associated with prosocial behavior. No statistically significant associations were found between gender and the behavioral measures. However, gender was found to be associated with the parent-report measure of prosocial behavior; specifically, gender was associated with the Helping (r_s = .14, p = .05) and Comforting (r_s = .18, p = .01) scale on the CPA. Descriptive information for the prosocial tasks are presented in Figure 1 and Table I.

Figure 1

Participants Mean Score Across Prosocial Tasks



Note. Scores on the behavioral measures were re-scaled by dividing scores on each of the ordinal scales by 3 to create a prosocial score out of 1 on each of the tasks. The mean score on each of the prosocial tasks (with standard error bars) is displayed.

Exploring the Relations Across Prosocial Subtypes and Age

Correlation Analyses

Results from the correlation analysis conducted across all ages are presented in Table 1. Several statistically significant associations were identified. First, there was a positive correlation between Age and participants' scores on the Blocked Door task and the Mini-Dictator game. An increase in Age was also associated with an increase in scores on the Sharing scale of the CPA. We found a positive correlation between the Broken Teddy task and the two simple prosocial tasks; specifically, scores on the Broken Teddy task were positively associated with scores on the Blocked Door and the Unequal Stickers tasks. Scores on the Pain Simulation were positively correlated with two other behavioral measures, including the Blocked Door task and the Broken Teddy task, and negatively correlated with scores on the Auditory Helping task. Finally, positive correlations were identified across the three scales of the CPA, including: the Helping scale and the Sharing scale; the Helping scale and the Comforting scale; and, the Sharing scale and the Comforting scale.

A second correlation analysis was conducted to assess whether the associations between variables were consistent across age. Results from the correlation analysis in younger participants (i.e., 3.5 to 5.5) versus older participants (i.e., 5.5 to 7.5) are presented in Table 2.

Similar patterns of statistically significant associations that appeared in the total sample were found in the younger sample. In the younger sample, Age was positively correlated with scores on the Blocked Door task and the Pain Simulation. Additionally, there was a positive correlation between the Broken Teddy task and the two simple prosocial tasks; specifically, scores on the Broken Teddy task were positively associated with scores on the Blocked Door task and the Unequal Stickers task. Scores on the Pain Simulation were positively correlated with scores on the Blocked Door task and negatively correlated with scores on the Auditory Helping task. Again, positive correlations were identified across the three scales of the CPA, including: the Helping scale and the Sharing scale; the Helping scale and the Comforting scale; and, the Sharing scale and the Comforting scale.

The associations in the older sample were less consistent with the patterns observed in the total sample. Again, Age was positively correlated with scores on the Blocked Door task. Additionally, Age was positively correlated with scores on the Broken Teddy task, and the Helping scale and Comforting scale of the CPA. In the older sample, scores on the Broken Teddy

Table 1

Full Sample Correlations (and Ns) Across Age, Prosocial tasks, and CPA

Variable	1	2	3	4	5	6	7	8	9	10
1. Age (months)	—									
2. Blocked Door	**.29****	—								
	(172)									
3. Unequal Stickers	.00	.14	—							
	(159)	(146)								
4. Broken Teddy	.11	**.26****	**.38****	—						
	(160)	(148)	(156)							
5. Auditory Helping	-.09	-.10	.04	-.06	—					
	(163)	(151)	(138)	(141)						
6. Mini-Dictator	**.15***	.06	.13	.09	.04	—				
	(163)	(169)	(156)	(157)	(163)					
7. Pain Simulation	.15	**.31****	.12	**.19***	**-.17***	.06	—			
	(170)	(156)	(143)	(145)	(151)	(170)				
8. CPA Helping	.14	.08	-.04	-.02	-.07	.01	.09	—		
	(180)	(166)	(152)	(153)	(158)	(177)	(163)			
9. CPA Sharing	**.18***	.07	.10	-.07	-.12	.06	.15	**.50****	—	
	(180)	(166)	(152)	(153)	(158)	(177)	(163)	(180)		
10. CPA Comforting	.12	.08	.04	.01	-.09	-.05	.11	**.37****	**.34****	—
	(180)	(166)	(152)	(153)	(158)	(177)	(163)	(180)	(180)	

Note. Spearman rank correlations are presented. Statistically significant effects are displayed in bold.

**p* < .05; ***p* < .001

Table 2

Correlations (and Ns) across Age, Prosocial tasks, and CPA for 3.5 to 5.5 (below) and 5.5 to 7.5 (above diagonal) Children

Variable	1	2	3	4	5	6	7	8	9	10
1. Age (months)	—	**.30****	.06	**.30****	-.02	.06	-.06	**.29****	.20	**.22***
		(81)	(75)	(76)	(82)	(88)	(80)	(84)	(84)	(84)
2. Blocked Door	**.27****	—	.17	.21	.06	-.11	**.34****	.01	-.01	.08
	(91)		(68)	(70)	(76)	(81)	(73)	(77)	(77)	(77)
3. Unequal Stickers	.02	.16	—	**.51****	.08	**.23****	.23	.02	**.27***	-.023
	(84)	(78)		(73)	(71)	(75)	(67)	(71)	(71)	(71)
4. Broken Teddy	.21	**.30****	**.30****	—	-.07	.06	.19	.16	.09	.08
	(84)	(78)	(83)		(73)	(76)	(68)	(72)	(72)	(72)
5. Auditory Helping	-.11	-.20	.01	-.06	—	.14	-.05	.05	-.12	-.15
	(81)	(75)	(67)	(68)		(82)	(74)	(78)	(78)	(78)
6. Mini-Dictator	.17	.15	.07	.14	-.04	—	.05	-.08	.09	.01
	(96)	(88)	(81)	(81)	(81)		(80)	(84)	(84)	(84)
7. Pain Simulation	**.26***	**.28***	.04	.19	**-.27***	.07	—	.03	.13	.06
	(90)	(83)	(76)	(77)	(77)	(90)		(76)	(76)	(76)
8. CPA Helping	.03	.10	-.09	-.16	-.16	.07	.12	—	**.41****	**.42****
	(96)	(89)	(81)	(81)	(80)	(93)	(87)		(84)	(84)
9. CPA Sharing	.09	.07	-.04	-.21	-.12	.00	.15	**.56****	—	**.36****
	(96)	(89)	(81)	(81)	(80)	(93)	(87)	(96)		(84)
10. CPA Comforting	.04	.05	.07	-.04	-.00	-.11	.14	**.32****	**.31****	—
	(96)	(89)	(81)	(81)	(80)	(93)	(87)	(96)	(96)	

Note. Spearman rank correlations are presented. Statistically significant effects are displayed in bold.

*$p < .05$; **$p < .001$

task were positively correlated with scores on the Unequal Stickers task but not on the Blocked Door task. In this particular analysis, positive associations were identified across the three measures assessing sharing behavior, such that scores on the Unequal Stickers task were associated with scores on the Mini-Dictator game and the Sharing scale of the CPA. As in both other analyses, positive correlations were identified across the three scales of the CPA, including: the Helping scale and the Sharing scale; the Helping scale and the Comforting scale; and, the Sharing scale and the Comforting scale.

Although the associations across the younger sample versus the older sample did vary, many similar associations were identified. Consequently, we made the decision to run subsequent analyses on the total sample for two reasons. First, patterns of associations emerged in both samples that were similarly reflected in the associations identified in the total sample. That is, counter to our predictions, we found statistically significant associations between various behavioral measures in the younger sample and we did not find statistically significant associations across all behavioral measures in the older sample. Additionally, the correlations across age and the behavioral tasks were inconsistent. Second, we did not want to cut our sample in two because EFA's require large samples (i.e., conducting an EFA requires a minimum sample size of 100; Kline, 2016) and we aimed to maintain power.

Principal Component Analysis

We aimed to explore the patterns of associations between subtypes across childhood by examining the factor structure of the underlying variables. We conducted a Principal Component Analysis (PCA) with varimax rotation. Helping, sharing, and comforting were each estimated by two observed scores and the three-scales of the parent-report measure.

The analysis identified a 3-component solution that included all nine variables accounting for 52.7% of the total variance. Bartlett's test of sphericity (1954) indicated that the correlation matrix was not random (X^2 (36) = 125.87, p = < .001). The KMO statistic was .60, landing above the minimum cut-off for conducting the analysis. Variable loadings are reported in Table 3. Components were labelled based on the underlying construct of the variables composing them. Component 1, accounting for 21.7% of the variance, was labelled *Parent-Reported Prosociality*. All three scales of the CPA (i.e., Helping, Sharing, Comforting) loaded on this component. Component 2, accounting for 18.0% of the variance, was labelled *Instrumental-Comforting*

Table 3

PCA Three-Component Solution

	Component Loadings		
Prosocial Behavior	1	2	3
Blocked Door	-.041	**.675**	.219
Unequal Stickers	.058	.179	**.737**
Broken Teddy	-.099	**.528**	**.516**
Auditory Helping	-.116	-.536	**.463**
Mini-Dictator	.041	-.042	**.535**
Pain Simulation	.155	**.684**	-.039
CPA Helping	**.809**	-.010	.058
CPA Sharing	**.827**	.073	.041
CPA Comforting	**.669**	.065	-.043

Note. N = 111. Component loadings above .40 are displayed in bold.

Prosociality. Three variables loaded on this component, including Blocked Door, Broken Teddy, and Pain Simulation, reflecting participant's responses in the instrumental helping task and both comforting tasks. Component 3, accounting for 12.9% of the variance, was labelled *Costly Prosociality*. Four variables loaded on this component, including Unequal Stickers, Broken Teddy, Auditory Helping, and Mini-Dictator, reflecting participant's responses in tasks that imposed a cost to themselves (e.g., listening to an aversive sound).

Standardized regression scores were saved from the 3-factor solution. A subsequent correlation analysis revealed no statistically significant associations between the scores on the 3-components.

Effects of Age and Gender

Results of the multiple linear regressions for each of the components are presented in Table J.

The overall regression model for the *Parent-Reported Prosociality* component was statistically significant ($R^2_{adjusted}$ = 0.082, $F(2, 108) = 5.92$, $p = .004$). Age was a statistically significant predictor of participant's scores on this component (b = 0.02, $p = .007$). Gender was not a statistically significant predictor of participant's scores on this component (b = 0.34, $p = 0.086$).

The overall regression model for the *Instrumental-Comforting Prosociality* component was also statistically significant ($R^2_{adjusted}$ = 0.058, $F(2, 108) = 4.40$, $p = .015$). Age was a statistically significant predictor of participant's scores on this component (b = 0.02, $p = .004$). Gender was not a statistically significant predictor of participant's scores on this component (b = 0.05, $p = .756$).

The overall regression model for the *Costly Prosociality* component was not statistically significant ($R^2_{adjusted}$ = 0.007, $F(2, 108) = 1.39$, $p = .254$). Neither Age (b = 0.01, $p = .101$) nor Gender (b = -0.06, $p = .758$) were statistically significant predictors of participant's scores on this component.

Discussion

Although young children frequently engage in helping, sharing, and comforting behavior, early instances of prosociality often do not correlate. The social-cognitive constraint account contends that distinct social-cognitive processes underlie each prosocial subtype (Dunfield, 2014). Based on this account, the distinctiveness of the three prosocial subtypes should decrease as children age and their social-cognitive abilities develop. In contrast, the motivation-based account posits that unique motivations underlie distinct responses (Paulus, 2018). Based on this account, the three prosocial subtypes should remain distinct as children age. Importantly, it remains unclear how the associations between distinct varieties of prosocial behavior change with age. This study aimed to examine the interrelatedness of the three subtypes by exploring age-related differences in the associations across subtype (i.e., helping, sharing, comforting) and across task complexity (i.e., simple versus complex).

From the social-cognitive perspective, we expected to see an increase in prosocial responding and greater relatedness between prosocial subtypes as children aged. The total sample correlation analysis revealed that age was positively associated with the Blocked Door task (i.e., simple helping) and the Mini-Dictator game (i.e., complex sharing). The former is somewhat surprising given very young children consistently respond to others' simple instrumental needs at high rates leaving little room for age related increases (Dunfield & Kuhlmeier, 2013). Indeed, all children in this study acted prosocially and there was little variation in children's responses, suggesting that this association may be a statistical artifact due to restricted range. The association between age and the Mini-Dictator game is consistent with previous research which finds that sharing behavior increases with age (e.g., Fehr et al., 2008). Therefore, of the six tasks administered, only two demonstrated the expected age-related increases.

Surprisingly, and inconsistent with past literature, none of the other behavioral measures were significantly associated with age. One possibility that may account for the lack of associations with age is the theory that prosocial behavior becomes more selective around 4- to 5-years-old (Hay, 1994; Hay & Cook, 2007). Specifically, Hay and Cook (2007) argued that - while older children are capable of engaging prosocially (i.e., their social-cognitive abilities are developed) - they become increasingly aware of context and social conventions, and consequently more selective in their prosocial engagement. Therefore, as the youngest children

studied in our sample were 3.5-years-old, it is possible that we did not find associations across age and other behavioral measures due to increased selectivity and stabilization in responding.

Associations in the Simple Prosocial Tasks

Rooted in the social-cognitive framework, we expected to replicate Dunfield and Kuhlmeier's (2013) findings regarding the lack of relations between the three types of prosocial responses in the simple tasks, especially in our younger sample (i.e., <5.5 years-old). However, our analysis revealed some statistically significant correlations among the three tasks in our younger sample, including: a positive association between helping and comforting, and a positive association between sharing and comforting. Why do the results differ from Dunfield and Kuhlmeier's (2013) study? One possibility is that our sample was somewhat older. Specifically, Dunfield and Kuhlmeier (2013) tested 2- to 4-year-olds whereas our younger sample was 3.5- to 5.5-years old. Behaviors like sharing and comforting are still early-emerging at 2-yeasr-old and stabilize around 4-years of age (Dunfield & Kuhlmeier, 2013). Therefore, children in our sample may have had an easier time recognizing and responding to each need. Relatedly, Dunfield and Kuhlmeier (2013) dichotomized prosocial responses (prosocial/not prosocial) whereas we used an ordinal scale. Additionally, Dunfield and Kuhlmeier (2013) used single and largely non-verbal cues (e.g., the experimenter looked down at an empty cup then at the child in the sharing task) whereas we provided cues that were increasingly explicit. In turn, a greater number of children may have been categorized as prosocial across all three of our tasks. Finally, Dunfield and Kuhlmeier (2013) used two simple tasks for each need whereas we only used one. While the difference in findings may reflect methodology, the results of our study further suggest that the distinctiveness among subtypes may decrease when young children receive more explicit scaffolding.

As social-cognitive abilities mature, older children should require less scaffolding to recognize and respond to distinct needs. Therefore, due to developed social-cognitive abilities and the simplicity of the tasks, we expected to find cross-task correlations across all three prosocial subtypes in the older age group (i.e., >5.5 years-old). However, only sharing and comforting were correlated in the older age group. Therefore, despite the maturation of underlying social-cognitive processes, children did not engage in prosocial behavior across all three tasks. This lends credence to the motivation-based account, in that different motivations may underlie each behavior.

Finally, we expected to find higher correlations among the helping and comforting tasks than the sharing task, as the interventions required in the simple helping and comforting tasks were both largely instrumental. When children recognize others' emotional distress in the simple comforting task, they can readily identify the most effective intervention (i.e., fix the broken teddy). Recognizing and responding instrumentally to others' emotional distress requires fewer mature social-cognitive abilities (e.g., affective perspective-taking, self-regulation) than responding to others' emotional distress when the appropriate intervention is affective or unclear. We found statistically significant associations between helping and comforting, in both the total sample and younger sample correlation analysis. However, we found a stronger and more consistent positive association across all three correlation analyses between sharing and comforting. Although this finding was unexpected, both tasks have some underlying negative affect that children are responding to (i.e., in the sharing task, the experimenter expresses some sadness when they open the box and notice they have no stickers), which could account for the correlation between the two tasks. Additionally, due to the nature of the coding scheme, it is possible that these two tasks correlated as children were responding to the experimenter's need at the same cue. That is, whereas responses to instrumental need require little explicit cueing (Warneken & Tomasello, 2008), the simple sharing and comforting task may have imposed certain social-cognitive demands that required scaffolding and explicit communication in order for children to engage in a response. Previous studies have found that explicit cues facilitate both sharing (Brownell et al., 2009) and comforting (Svetlova et al., 2010). Therefore, children may have only responded after the cue was made explicit in both tasks. In comparison, children may have engaged in helping more spontaneously than both sharing and comforting, as recognizing an instrumental need was easier for children in our sample. This could account for the lack of associations between the three subtypes.

Associations in the Complex Prosocial Tasks

Due to the cognitive-demands of these prosocial tasks, we expected to find no cross-task correlations in the complex tasks in the younger age group (i.e., < 5.5 years-old). As predicted, most of the complex tasks did not correlate in the younger age group. However, we did find a negative association between helping and comforting – an association that also appeared in the total sample correlation analysis. We believe this may be explained, in part, by the task demands imposed by the complex helping task (i.e., Auditory Helping). The Auditory Helping task was a

novel experimental paradigm, based on Hoffman et al.'s (2021) Gustatory costly Helping task. However, the latter was conducted in a sample of 6- to 12-year-old children. It is possible that the youngest children in our sample did not understand the rules of the task. Missing data patterns for the Auditory Helping task supports this conclusion, whereby younger children were more likely to drop out of the task. Additionally, rather than listening to sounds on behalf of their partner, the Gustatory costly Helping task involved drinking a bitter solution – a need that was potentially more averse and more salient than the need presented in this study. Taken together, we believe the negative association between helping and comforting should be interpreted with caution. Future work must further consider the task demands imposed by a costly helping task.

Finally, we expected to find cross-task correlations in the complex tasks in the older age group (i.e., >5.5 years-old). Counter to our predictions, none of the complex tasks in the older age group were correlated. This finding lends credence to the motivation-based account, suggesting that unique motivations lead to differential engagement in each distinct subtype, even after social-cognitive abilities are in place.

Associations Across Task-Complexity

From a social-cognitive constraint account, we expected to find no correlations across task-complexity (i.e., from simple to complex) in the younger age group, as identifying the appropriate intervention, and determining an appropriate response, in the complex tasks required more mature social-cognitive abilities. In contrast to our prediction, we found a significant positive correlation between simple helping and complex comforting in all three of the correlation analyses. Although this association may be explained by the overall high rates of helping, the coding scheme of the complex comforting task (i.e., Pain Simulation) also included scores for instrumental comforting (i.e., opening the clipboard for the experimenter). Therefore, the intervention children identified as most appropriate in both contexts could be instrumental in nature, explaining the association between them. Moreover, in comparison to the simple tasks, the complex comforting task did not have increasingly explicit cues. Meaning, if children acted prosocially in the task, they spontaneously recognized and responded to the experimenter's emotional distress. Therefore, they may also have been more likely to spontaneously recognize and respond to the instrumental need in the simple helping task, accounting for the association between the two tasks. Researchers have found progressive associations between instrumental

helping and empathy-based comforting when children age and their need for explicit cues decreases (Svetlova et al., 2010).

We expected to find correlations among each subtype across task complexity in the older age group. That is, consistent with past literature (e.g., Dunfield & Kuhlmeier, 2013), we expected that behaviors that responded to the same need would associate. As expected, simple sharing and complex sharing were positively correlated in the older sample correlation analysis. The need expressed (i.e., material desire) and the most appropriate response (i.e., sharing) were the same in both tasks. In comparison to all the other behavioral tasks, these two measures were most similar, as each task imposed a cost (i.e., the child had to give up their stickers on behalf of the experimenter or another child). However, apart from the positive association between simple helping and complex comforting previously described, we did not find any other associations across task complexity in the older sample correlation analysis.

Although we expected to find a strong association between the simple comforting task and the complex comforting task in the older age group only, a positive association between these two behaviors actually appeared in the total sample correlation analysis. As previously described, the coding scheme of the complex comforting task included scores for instrumental comforting. Similarly, the most appropriate response in the simple comforting task was instrumental in nature (i.e., help fix the experimenter's broken teddy). The similarities between the responses in these two tasks could account for their association. Moreover, the fact that this association appeared in the total sample and not in the younger/older samples suggests that once children have developed an understanding of others' internal states, individual differences in motivation (e.g., empathic concern; Paulus, 2018) underlies children's comforting behavior.

Counter to our predictions, we did not find any statistically significant correlations between the simple helping task and the complex helping task in any of the correlation analyses. In addition to the task-demands imposed by the Auditory Helping task, it is possible that even when the need expressed is the same, children's responses are context-dependent. Previous research has suggested that children's engagement in helping behavior varies as a function of cost (Sommerville et al., 2018) and familiarity with the recipient (Allen et al., 2018). The simple helping task provided an opportunity for children to engage in low-cost instrumental helping towards an experimenter they had interacted with over the course of a 1.5-hour testing session (i.e., the Blocked Door task was the last task administered). In comparison, the complex helping

task involved interpreting an ambiguous need and responding at a cost to themselves on behalf of a partner they had no prior experience with. Therefore, even if both tasks aimed to assess children's response to instrumental need, it is not entirely surprising that behavior across these tasks did not correlate.

Heterogeneity of Subtypes Across Childhood

In addition to the correlation analyses, we aimed to examine the relationship between helping, sharing, and comforting by conducting a PCA. The PCA identified a component structure with three prosociality dimensions, including: i) Parent-Report, ii) Instrumental-Comforting, and iii) Costly.

The Parent-Report Prosociality component was composed of the three scales of the CPA. We found that the three scales had strong correlations in all three correlation analyses, and that only the Sharing scale of the CPA was positively correlated with simple sharing in the older sample correlation analysis. Overall, parents did not distinguish between the three types of behavior in our study. While some studies have found that parents can differentiate between prosocial subtypes (e.g., Giner Torréns & Kärtner, 2017), the questionnaires administered in those studies were validated in a younger sample. Taken together, this suggests that parent-reported prosociality may reflect one global prosociality factor as children age. In support of this perspective, although the reliability of each individual sub scale was low (alpha = .431 to .759), the overall reliability was higher at .769. Results from the multiple regression analysis revealed that age was a statistically significant predictor of scores on this component. Although this may suggest that children's prosociality increased as they aged, it is also likely that parents with older children had more opportunities to witness their child engage in each situation presented. Additionally, as parent-reported prosociality was not associated with behavioral measures, parents' views may be a biased and inaccurate estimate of children's prosociality. Similarly, although we did not find an effect of gender in the regression analysis, gender was associated at a statistically significant level with scores on the Helping scale and the Comforting scale in the correlation analysis. Critically, we found no statistically significant gender differences in any of the behavioral measures. This is consistent with past research; specifically, when gender differences in prosociality have been found, they are most often reported when measured by self- or parent-report (Eisenberg et al., 2015). Therefore, it appears as though parents' expectations regarding their children's prosocial behavior may bias the accuracy of their responses. Future

work should consider creating a teacher-version of the CPA, as teachers may be more reliable respondents (Stone et al., 2010). However, as the reliability and internal consistency of the CPA scales were weak, we cannot make strong claims regarding this component.

The Instrumental-Comforting Prosociality component included: simple helping, simple comforting, and complex comforting. This finding is similar to the recent work conducted by Paz et al. (2023). In a longitudinal sample, Paz et al. (2023) studied children's prosocial behavior in behavioral tasks assessing helping, sharing, and comforting at 18-months and 36-months. When contrasting measurement models, they found the best model fit for a 2-latent factor model at both ages, with factors they labelled *Instru-Compassionate* and *Sharing*. We have evidence for the same component-structure in an older sample. Additionally, results from the multiple regression analysis revealed that age was a statistically significant predictor of scores on this component. From a social-cognitive framework, associations between helping and comforting increased as children aged due to mature supporting social-cognitive abilities. This may also suggest that from 3.5-years of age, the same motivation underlies children's responses to instrumental need and emotional distress (e.g., empathic concern with others' well-being).

The Costly Prosociality component included: simple sharing, complex sharing, and complex comforting. Although similar to the Paz et al. (2023) factor-structure, this component highlights that it is not the act of sharing itself, but rather, the cost associated with it. In this study, both sharing measures were included in the component structure. Additionally, the complex comforting measure was included, as engaging in the prosocial response (i.e., listening to an aversive sound) was costly. Previous studies have found that engagement in prosocial responding varies as a function of cost (Chernyak et al., 2018). Prosociality decreases when responding to an others' need is associated with a cost to the self, including the cost of giving up a material resource (House et al., 2013) or the cost of experiencing others' distress (Hoffman, 2000). To that end, children in our study had to incur the cost of giving up a sticker on behalf of the experimenter or an unknown child, and the cognitive cost of experiencing their partner's distress and listening to the aversive sound, in the sharing task and helping task, respectively. Results from the multiple regression analysis revealed no statistically significant associations between age and scores on this component. From a social-cognitive framework, this suggests that even when supporting social-cognitive abilities (e.g., inhibition) are mature, children do not necessarily engage in costly prosocial behavior. Moreover, in Paz et al.'s (2023) study, they

found that children who shared after a direct request at 18-months were unlikely to spontaneously share at 36-months, suggesting stability over time in children's willingness to engage in costly prosocial behavior. Therefore, in comparison to other forms of prosocial behavior, engagement in costly prosociality may reflect individual differences in children's motivations, including empathic concern (Hoffman, 2000) and moral self-concept (Paulus, 2018).

Limitations

Several limitations should be noted. As previously discussed, the difficulty of the complex tasks may have been too much for the youngest children in the sample to understand. Although efforts were taken to validate the measures in the youngest age range (i.e., pilot testing), missing data trends for the Mini-Dictator game and the Auditory Helping task suggest that the tasks may not have been the best measures in this age group. Future research should consider simplifying the instructions and excluding participants on the basis of memory check questions.

An additional limitation includes the use of listwise deletion in the PCA. The use of listwise deletion resulted in a loss of 76 participants and may have subsequently influenced the interpretability of the results. We suggest re-running the analyses using a different statistical software (e.g., MPlus) and applying an imputation technique such as the Full Information Maximum Likelihood (FIML) method, as this is one of the best approaches to handle missing data (Schlomer et al., 2010). Doing so would allow for the analysis of a larger sample and consequently, a more conclusive understanding of the underlying component structure.

Relatedly, it is important to note that there was some degree of overlap in the factor loadings for the Broken Teddy task (i.e., simple comforting), whereby scores on this measure loaded on both the Instrumental-Comforting Prosociality and the Costly Prosociality components. The overlap may be explained by the cognitive cost associated with experiencing others' distress (Hoffman, 2000). However, we made the decision to include simple comforting in the Instrumental-Comforting Prosociality component, as the factor loading was stronger and the component structure was consistent with previous findings (e.g., Paz et al., 2023). Nonetheless, future research should explore the overlap in the component structure by conducting a revised simple comforting task with a more ambiguous instrumental intervention to capture a diversity of responses, rather than just one (i.e., fixing the broken teddy).

Moreover, there was little variability in responses in the simple helping task. It is possible that the Blocked Door task was too easy for children in this age-range. However, previous uses of this task find variability across participants in a similar age range (Dunfield et al., 2023). One possibility is that the high rates of helping may be explained by a possible study confound. We noticed a few children in the study were quick to leave the testing room when the experiment was over, possibly due to the extremely long testing-session. Measures were taken to exclude the participants that opened the door prior to the delivery of the first cue, however it is possible that this task was assessing self-centered as opposed to other-oriented considerations.

A strength of this study was the inclusion of two tasks assessing each need, as it allowed us to draw stronger conclusions regarding the interrelations between prosocial subtypes. Nonetheless, this experiment was conducted in a laboratory-based environment and results may have been influenced by the features of the methodology. Results from naturalistic studies have suggested that laboratory-based experiments grossly overestimate the rates of need-based responding (Tavassoli et al., 2023). Future work should consider incorporating naturalistic observations in a similar experimental design.

Additionally, the results of this study apply to the specific sample studied and may not generalize to other cultural contexts. Engagement in prosocial subtypes have been found to vary based on cultural context, even more so when the cost of engaging prosocially is increased (Chernyak et al., 2018; House et al., 2013). Therefore, the heterogeneity of prosocial subtypes in childhood may change across contexts resulting from cultural differences in social-cognitive abilities and underlying motivations. Finally, this study was conducted cross-sectionally and used a variable-centered approach. In order to further investigate the interrelatedness across subtypes, future research would benefit from longitudinally studying age-related differences in the associations across subtype at an individual level, and in various cultural contexts.

Conclusion

Overall, this study aimed to examine the interrelatedness of three subtypes of prosocial behavior by exploring age-related differences in the associations across subtypes and task complexity. Results suggest that prosocial subtypes partially converge with age, but that the frequency of responding may be differentiated on the basis of cost. This suggests that the social-constraint account alone cannot fully explain the lack of associations across subtypes. That is,

both unique and common social-cognitive abilities and motivations help explain the heterogeneity of prosocial behavior in childhood.

As prosocial behavior is associated with various positive developmental outcomes (Caputi et al., 2012; Dunn et al., 2002), promoting prosociality in childhood is essential. In order to design and implement effective prosocial interventions, researchers have to consider the underlying social-cognitive abilities required to recognize and respond to a certain need, the unique motivations that work to alleviate the need, and the cost of engaging in the behavior.

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Appendix A

Experimenter Cues and Coding Scheme for Blocked Door Task

Time in s	Instructions	Need displayed	Score
Experimenter picks up boxes and walks towards the door with both arms full while pretending they are very heavy. • First 20s spent struggling to free a hand from heavy boxes • After 20s, alternate gaze between child and door while saying cues		No need	
0:00	E attempts to open the door once with foot or elbows.	Bodily expression of general need	7
0:05	E makes "hmm" sound and looks at the door.	Expression of concern	6
0:10	E says "I can't get through"	Verbal expression of general need	5
0:15	E says "I can't get the door"	Drawing attention to the target	4
0:20	Alternate gaze between the child and the door.	Non-verbal request to get the door	3
0:25	E says "Can you help me?"	General verbal request for help	2
0:30	E says "Can you help me open the door?"	Specific verbal request for help	1

Appendix B

Experimenter Cues and Coding Scheme for Unequal Stickers Task

Time in s	Instructions	Need displayed	Score
E1 will look into the storage box and say "what do I have here?" then take the two colour-matched Tupperware from the box and check (without the child seeing) the marking on the bottom. Place the child's (closed) Tupperware in front of them, attempt to open your Tupperware. When child opens their Tupperware, then open your Tupperware, show it to the child: • first 20s spent looking at your own container • then alternating gaze between child and your own container while saying cues		No need	
0:00	E shows their Tupperware to the child and says "Look what I have" in a sad tone, with a sad expression	Vocal expression of general need	7
0:05	E says "I don't have anything"	Lack of resources	6
0:10	E says "I want something too!"	Verbal expression of general need for a resource	5
0:15	E points to child's stickers and says "you have stickers!"	Drawing attention to the target that would meet the need	4
0:20	E alternates gaze between the child and their own Tupperware.	Non-verbal request for stickers	3
0:25	E looks at child and says "Can you share?"	General verbal request for sharing	2
0:30	E looks at child and says "Can you share your stickers?"	Specific verbal request for sharing	1

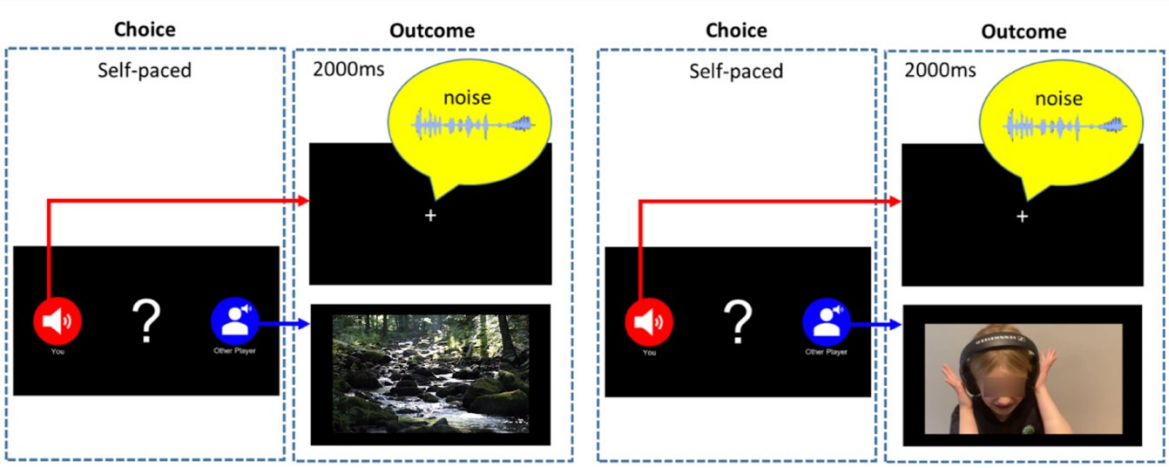
Appendix C

Experimenter Cues and Coding Scheme for Broken Teddy Task

Time in s	Instructions	Need displayed	Score
In this task the experimenter will take out her favourite teddy bear. Show it to the child and tell them how much she loves her teddy, hug the teddy for a few moments. • First 20s spent looking at teddy while whimpering • next 15s spent alternating gaze between teddy & child while saying cues		No need	
0:00	Using the rigged teddy, E shakes the bear and releases the arm. Looks surprised then sad when the teddy's arm falls off; E says "Oh no!"	Vocal expression of general need	7
0:05	E says "I'm sad…"	Naming the internal state	6
0:10	E says "My Teddy broke!"	Verbal expression of general need	5
0:15	E points to arm and says "Look the arm fell off!"	Drawing attention to the target	4
0:20	Alternate gaze between the child and the teddy.	Non-verbal request to get the arm	3
0:25	E says "Can you do something?"	General verbal request for comforting	2
0:30	E says "Can you make me feel better?"	Specific verbal request for comforting	1

Appendix D

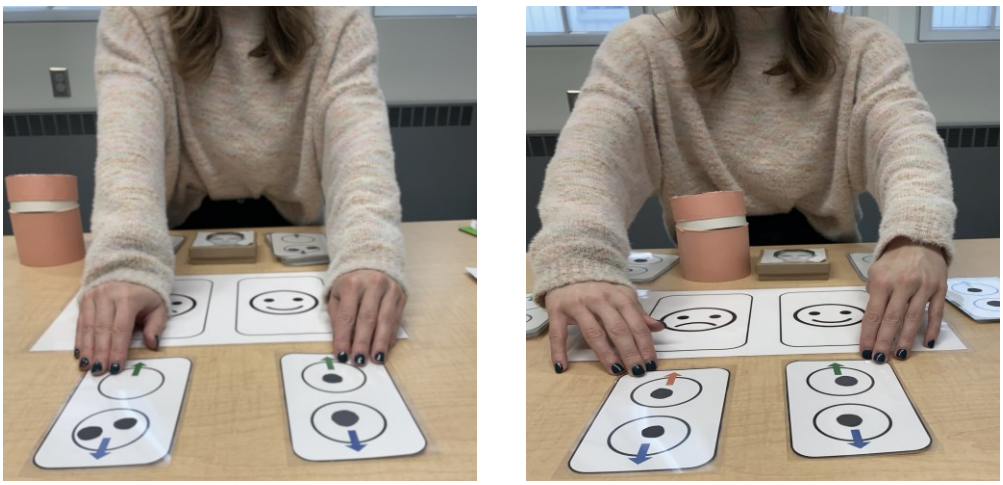
Experimental Paradigm for Auditory Helping Task



Note. Participants selected between a red button (listened to the sound) or a blue button (partner listened to the sound) in an escape (left) and no-escape (right) condition.

Appendix E

Experimental Paradigm for Mini-Dictator Game



Note. In the costly condition (left), participants were asked to select between two distributions of card, 2:0 or 1:1. In the non-costly condition (right), participants were asked to select between two distributions of cards, 1:0 or 1:1.

Appendix F

Experimenter Cues for Pain Simulation

Time in S	**Instructions**	**Facial Expression**
"Now I have to look again briefly in my sheets to see what we're going to play next." E1 is putting away the materials from the previous task and looking through his/her documents. S/he gets his/her **left thumb** caught by the **clipboard** [loud noise].		neutral
0:00	"Ouch!" E **puts down** the clipboard and **holds** his/her left thumb. E **rubs** and **blows** his/her left thumb.	painful/ distressed
0:10	"I pinched my finger!" E **rubs** and **blows** his/her left thumb.	
0:20	"Ouch, my finger does really hurt." E **rubs** and **blows** his/her left thumb.	
0:30	"But I think it's getting better now." E **continues rubbing and blowing** his/her left thumb, but **gradually lower intensity of pain** display.	gradually less painful/ distressed
0:40	"Now it's getting better again." The **pain slowly ceases**.	
0:50	"Yes, the pain is almost gone now." The **pain slowly ceases**.	
0:60	"That really hurt but I'm feeling better now. So, let's move on with the next game! [introduce the next task]"	neutral

Appendix G

Childhood Prosocial Assessment (CPA)

How often does your child engage in the following behaviours? Please consider every effort your child makes regardless of whether the child is "successful" in their attempt.

Never		Some-times		Always	Not seen
1	2	3	4	5	

My child:

1. Will say sorry after being asked when they hurt another child.
   1 2 3 4 5 Not Seen

2. Will try to distract another child who is crying.
   1 2 3 4 5 Not Seen

3. Will avoid helping another child clean up even after being asked.
   1 2 3 4 5 Not Seen

4. Will try to console another child who is worried or afraid.
   1 2 3 4 5 Not Seen

5. Will not share their sweets with me even if I ask them to.
   1 2 3 4 5 Not Seen

6. Will help me tidy up after a snack or a meal when I'm in a hurry.
   1 2 3 4 5 Not Seen

7. Will give me some of their favourite food without being asked.
   1 2 3 4 5 Not Seen

8. Will try to cheer me up if I'm clearing having a bad day.
   1 2 3 4 5 Not Seen

9. Will give me some of their food if I say I like that food.
   1 2 3 4 5 Not Seen

10. Will help another child who is struggling with a task even if my child has to stop what they are doing.
    1 2 3 4 5 Not Seen

11. Will avoid sharing toys with another child even if the other child has nothing to play with.
    1 2 3 4 5 Not Seen

12. Will try to calm another child who is having a temper tantrum.
    1 2 3 4 5 Not Seen

Appendix H

Coding Scheme for Pain Simulation

Rating	Hypothesis testing	Empathic Concern	Prosocial acts	Self-distress (for details, see next sheet)	Avoidance	Antisocial Behavior	Combined global rating of empathy (Young et al., 1999)
0	No gaze at victim Only looking at victim's face or only looking at injury; only looking once at face and then at finger	No empathic concern **Slight change in facial expression** (Brow furrow, slight or fleeting changes), brief, one very slight movement (might be out of surprise and not concern)	No prosocial acts	No signs of distress	No signs of avoidance	No antisocial behavior	1: None, unresponsive; inappropriate (child laughs, is annoyed)
1	Mulitple times looking from injury to victim's face (exploratively scanning)	Empathic facial expression (persistent or repeated expression of concern that includes brow furrow, **overall more than 3 seconds**); **and / or** single empathic vocalization (uh, oh or ah) - *tone of voice* is decisive, not content; **Or** single empahthic verbal utterance without change of facial expression	Briefly assisting verbally or nonverbally (pointing to/out helpful items); Verbal elaboration (Be careful, **Are you okay?**); Non-egocentric statement (Mum has band aids); Blaming the object; Sharing own experiences with pain; **Empathic smile** (eye-contact with E) in combination with approaching E (intention to cheer up E should be clear); Verbally offering instrumental help (I can open the clipboard, Should I open the clipboard?)	Light signs of distress	Slight disengagement or avoidance of experimenter's distress - averting the gaze, looks or turns away	Groaning (annoyed sigh), Annoyed comment (verbalization of groaning)	2: very mild concern (only facial expression, no verbal uttarance), no prosocial acts 3: Mild - moderate concern, no prosocial action 4: moderate - strong concern, no prosocial action or (very) mild concern and some prosocial action Up to 4.5 no prosocial acts necessary
2	Simple verbal exploration: Single verbal utterances ("Hurt?); Imitation (Saying "ow", rubbing finger); Verbal sign of understanding (Saying "Yes" or "Mhm" immediatly after a cue); *content* is decisive; **Or** postural approach with non-verbal exploration (pointing, focusing, head movement)	Moderate to more intense facial expression and either empathic verbal utterance ("I'm sorry"), **Or** multiple vocalizations (soothing voice), **Or** moderate gestural-postural expression (leaning forward/ pointing/head movement in combination with empathic face and/or tone); expressed for a long duration, but with moderate intensity; OR: expressed intensely but relatively briefly	Verbally offering help (Can I help you? Do you need a band aid?); Egocentric ("I") statement or question containing "you" ; Sharing (giving sth. to victim), Start joint activitiy, etc. to cheer up victim (intention to cheer up E must be clear rather than ignore the incident, sign for joint activity: empathic or engaging tone) Protecting victim (placing object out of reach of E to prevent future injuries); Instrumental helping (opening the clipboard, showing how to open it)	Moderate signs of distress	Moderate disengagement: remains turned away a good portion of the episode (at least one-third, i.e., 20 seconds in sum) **Or** Occupation with own garment/accessory Bury/hide face in hands/soft toy	Aggressive laughter / mocking; Saying: now stop that in an annoyed tone	5: Moderate concern, some prosocial behavior 6: moderate - strong concern, moderate prosocial behavior or moderate concern, strong prosocial behavior
3	Single incidence of combination of nonverbal and verbal exploration; **Or** repeated verbal one-worded utterances; **Or** single verbal exploration and sophisticated non-verbal exploration (longer postural approach to explore)	Great concern: Substantial change in facial expression (expressed in cooing or sympathetic vocal tones, sympathy face); **Or** moderate facial expression and substantial gestural-postural expression; And each of those *needs to be combined with verbal utterances or vocalization as defined in 3* Expressed for long duration (at least 5 seconds) and with high intensity	Physical comforting (patting, hugging, kissing); getting helpful items (cool pad, band aid); requesting help from another adult; singing a song	Strong signs of distress	Strong disengagement: Child fully retreats from experimenter distress **Or** Distraction by attention to stamps / treasure map / sticker / drink (often associated with statements / questions about it as well as actions with it). *If it is happening with empathic concern or in a very happy tone, It could also be a **distraction** of the person in pain -> PSB*	Aggressive behavior (does probably not occur) Throwing / hitting / bad name calling ("Heulsuse");	7: Strong expressions of concern and caring behavior
4	Repeated, sophisticated attempts to comprehend the problem (e.g., asking, "Does it hurt? Did you pinch it?" **Or** looking behind or underneath the injury to ascertain cause)				Never engaged: Child is unresponsive - did not look at the victim at all throughout the entire episode **Or** Leaving the room without explanation		

Appendix I

Summary Statistics for Prosocial Tasks

Table I

Descriptive Statistics for Scores on the Prosocial Tasks

	Descriptive Statistics				
Prosocial Tasks	*N*	*M*	*SD*	*Min*	*Max*
Young (3.5 to 5.5)					
Blocked Door[a]	91	2.71	0.58	1	3
Unequal Stickers	84	2.06	0.95	0	3
Broken Teddy	84	1.76	1.10	0	3
Auditory Helping	81	0.36	0.34	0	1
Mini-Dictator	96	0.49	0.33	0	1
Pain Simulation	90	0.60	0.80	0	3
Old (5.5 to 7.5)					
Blocked Door[a]	81	2.89	0.39	1	3
Unequal Stickers	75	2.09	0.74	0	3
Broken Teddy	76	1.72	1.06	0	3
Auditory Helping	82	0.31	0.30	0	1
Mini-Dictator	88	0.57	0.36	0	1
Pain Simulation	80	0.71	0.36	0	3

Note. The sample sizes (*N*) take into account only the participants who completed the task. Means (*M*), standard deviations (*SD*), and minimum (*Min*) and maximum (*Max*) scores are presented for each of the prosocial asks.

[a] The Blocked Door task was coded on a 4-pt scale. However, all of the participants in the study engaged in instrumental helping.

Appendix J

Multiple Linear Regressions for Three-Component Scores

Table J

Multiple Linear Regressions for Component Scores, Age, and Gender

	B	95% CI for *B*	*β*	*t*	*p*
Parent-Reported Prosociality					
Constant	-1.48	[-2.39, -0.56]	-	-3.20	.002
Age (months)	0.02	[0.01, 0.03]	0.25	2.75	.007
Gender[a]	0.34	[-0.03, 0.71]	0.17	1.83	.07
		Overall Model Fit	$R^2_{adj} = 0.082$ ($N = 111$, $p = .004$)		
Instrumental-Comforting Prosociality					
Constant	-1.22	[-2.08, -0.36]	-	-2.80	.006
Age (months)	0.02	[0.01, 0.03]	0.27	2.92	.004
Gender[a]	0.05	[-0.29, 0.40]	0.03	0.31	.756
		Overall Model Fit	$R^2_{adj} = 0.058$ ($N = 111$, $p = .015$)		
Costly Prosociality					
Constant	-0.68	[-1.61, 0.24]	-	-1.47	.146
Age (months)	0.01	[-0.00, 0.03]	0.16	1.66	.101
Gender[a]	-0.06	[-0.43, 0.31]	-0.03	-0.31	.758
		Overall Model Fit	$R^2_{adj} = 0.007$ ($N = 111$, $p = .015$)		

Note. $N = 111$. We examined the influence of age (months; continuous) and gender on the three components. CI = confidence interval.

[a] Boy = 0, Girl = 1.