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**INFANTS' MORAL EXPECTATIONS ABOUT  
AUTHORITY FIGURES**

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## Abstract

Existing literature suggests that infants are able to represent a dominance relationship and hold different expectations towards the actions of dominant and subordinate individuals. However, it remains unknown whether infants' expectations of moral principles such as fairness and care would be moderated by the social statuses of individuals. The present research investigates infants' expectations related to the moral actions of an authority figure towards her subordinate and vice versa. In a series of eye-tracking experiments, we tested whether young infants at 18- to 33-month-old expect the authority figure to behave fairly (Experiment 1), that the authority figure should be helpful rather than harmful towards subordinates (Experiment 2), and that subordinates should be helpful instead of harmful towards authority figure (Experiment 3). Results reveal that infants expect authority figures and subordinates to be differentially guided by the principle of fairness and the principle of care. Specifically, infants expect that (a) an authority figure should be fair and altruistic, (b) an authority figure should help and not harm subordinate, (c) subordinate should not harm an authority figure, but neither are they expected to help an authority figure.

# Chapter 1

## Literature Review

### 1.1 Introduction

Recently, developmental researchers have begun to investigate infants' expectations of early social interactions among individuals and the principles that underlie these expectations (Baillargeon et al., 2015). Premack (2007) proposed that humans are born with specific sociomoral principles that determine what actions are obligatory, permissible, or impermissible in social interactions, and using these principles, infants can make sense of social interactions among individuals by forming expectations of behaviors in the context of the interaction. The current research adopted this principle-based approach to examine sociomoral reasoning in infancy.

Researchers have identified and explored four candidate sociomoral principles: fairness, ingroup loyalty, reciprocity, and no-harm/care, and more recently, a fifth principle—authority (Baillargeon et al., 2015). While each principle has been investigated extensively, developmental psychologists have begun to look at the interactions between the principles. For example, recent studies examined the question of which principle—ingroup loyalty or principle of fairness, would prevail when the two principles are in conflict (Jordan, McAuliffe, & Warneken, 2014; Sloane, Baillargeon, & Premack, 2012). Finding out how infants prioritize one principle over the other from a

developmental perspective is critical for researchers to uncover the development of the morality. The current research intends to contribute to the literature on the interactions between the principle of authority and the principles of fairness and care. In the studies of infants' moral reasoning about authority, it was revealed that infants hold different expectations about the actions of dominant and subordinate individuals (Thomsen, Frankenhuis, Ingold-smith, & Carey, 2011). Specifically, infants expect the authority figure to prevail over the subordinate figure across different situations (Mascaro & Csibra, 2012). However, it remains unknown whether infants expect the authority figure to prevail in a moral context when the other principles (e.g., principle of care, principle of in-group loyalty) are violated. Evidence on sociomoral reasoning in infancy has shown that by two years old, infants' interpretations of individuals' actions are guided by principles of fairness and care (Baillargeon et al., 2015). Little research has been done to investigate whether infants reason that authority figures should also follow these two principles. Do they think authority figures have the privilege to behave unfairly or to harm others? Or do they think authority figures ought to follow these principles as well? The present research focuses on how infants reason about the actions of a dominant individual towards her subordinates in the context of the principle of fairness and the principle of care.

The purpose of this research is three-fold. First, it aims to investigate whether infants expect an authority figure to be fair. Second, it examines whether infants expect an authority figure to extend help instead of commit

harm towards a subordinate figure. Lastly, it aims to further explore infants' ability to form representations of dominance relationships and to reveal the differences in infants' expectations towards the authority figure and the subordinate figure. In three eye-tracking studies, we investigate whether expectation of fairness and care would be moderated by the different social statuses of individuals.

The present study employs the violation-of-expectation (VOE) paradigm to examine infants' expectations about authority figures. Studies on psychological and sociomoral reasoning widely adopt a VOE approach in investigations involving infants (Baillargeon, et al., 2015; Baldwin & Moses, 2001; Luo & Baillargeon, 2005). This method is based on infants' robust tendency to look longer at events that violate their expectations than at events that are within their expectations. Longer fixation indicates more time was spent in information processing (Yang, 2000). Fixations constitute rich data that can tell us what was fixated, for how long, how many times, and in what order (Liversedge, Paterson, & Pickering, 1998). Fixation duration is linked to cognitive processing time. Changes in cognitive load are indicative of violation of expectation (Hespos & Baillargeon, 2008). Using the VOE method, if infants view two separate events and their looking time is statistically longer on one of the events, then they may possess an expectation the event with longer looking time is less likely to have occurred than the other.

In the following sections, I will present an overview of the theoretical background of the current research. I will first review the importance of

authority in the development of morality and propose the need to explore how children perceive authority figures should behave in the moral realm. Following that, I will review the existing research on the principle of authority, the principle of fairness, and the principle of no harm/care respectively. Finally, I will present the rationale for the current research and an overview of the design of the three studies.

## **1.2 The significance of authority in the development of morality**

Morality is an essential part of our social lives. Humans have extensively discussed the topic of morality since the early ages, dating as far back as the scholarly discourse of Greek philosophers such as Plato and Aristotle (Graham et al., 2011). Developmental psychologists are particularly interested in the study of the development of morality (Baillargeon, et al., 2015). Developmental psychologists commonly agree that morality refers to “individuals’ treatment of others, not just the self, and reflects individuals’ intentions and motivations for actions” (Killen & Smetana, 2015, p. 702).

Researchers have long discussed the conflicting theoretical positions about the nature of morality. Debates about the nature of morality have two main theories: constructivism versus naturalism. Despite the marked differences between two theories of the nature of morality, it is notable that both theories assume that authority plays an important role in the development of morality. The differences and similarities of both theories will be reviewed as following.

Traditionally researchers have suggested that morality is acquired (e.g., Kohlberg, 1969; Piaget, 1932). Piaget (1932), one of the leading moral

development theorists who investigated the origin of morality, claimed that children develop morality from the respect for authority figures (e.g., parents) and their rules. In particular, Piaget argues the moral judgments of children between the age of 5 and 10 years are heteronomous (other-directed). These judgments are influenced by their relations with adults, who are the primary authority figures for children. It is not until the end of middle childhood that children's understanding undergoes a shift from heteronomous thinking to autonomous thinking. Another moral theorist, Kohlberg (1969, 1971), identified three levels of moral development: pre-conventional, conventional, and post-conventional. Based on the study of moral dilemma (Kohlberg, 1976; Colby & Kohlberg, 1987), it was argued that young children's moral reasoning reflects an egocentric concern with the punishment or the obedience of adults (Stage 1 & 2). In the conventional stage, morality is based on the need to adhere to rules and conventions. Children's moral reasoning is driven by authority and the societal prescriptions (Stage 3 & 4). Only in the post-conventional stage, individuals develop their own principles of justice beyond rules and conventions of the social system (Stage 5 & 6). Both Piaget's (1932) and Kohlberg's (1976) theories claim that authority figures are the primary sources of morality for children. Children learn to develop mature moral cognitions and evaluations from authority figures in their environment.

In contrast, recent researchers have argued that human morality is innate (Haidt & Joseph, 2007; Harmlin, 2013; Katz, 2000; Premack & Premack, 1994). Haidt and Joseph (2004) differ from the traditional point of view,

arguing that moral judgment is guided by intuition rather than reasoning. Haidt and Joseph (2004, 2007) developed the moral foundation theory (MFT) to explain similarities and variations in people's moral beliefs across cultures. It postulates the existence of five universal and innate moral foundations. These evolutionarily rooted foundations include: (1) Care/harm: This foundation demonstrates humans' evolutionary tendency to show concern for the suffering of others. It emphasizes the virtue of kindness and compassion. (2) Fairness/cheating: This foundation is related to the moral concern with reciprocal altruism and aversion to unfair treatment. It underlines that humans value justice, rights, and autonomy. (3) Loyalty/betrayal: This foundation values the obligation of group membership and self-sacrifice for the group. (4) Authority/subversion: This foundation is related to humans' innate ability to form hierarchical relationship. It pays attention to the social order and the deference and respect behavior to the authority. (5) Sanctity/degradation: This foundation is related to concerns with purity and contamination.

Similarly, Premack (2007) proposed that human are born with specific sociomoral intuitive principles which determine expected and unexpected behaviors in social interactions. Within the domain of sociomoral reasoning, infants make sense of social interactions among individuals in a scene based on moral principles. Researchers have identified and explored five candidate sociomoral principles: fairness, ingroup loyalty, no-harm/care, reciprocity, and authority, which correspond to Haidt and Joseph's (2004, 2007) MFT (Baillargeon, et al., 2015). Notably, in both theories of innate morality,

authority is deemed as one of the innate moral foundations or moral principles across cultures. Infants are said to be born with the ability to form a social dominance relationship (Haidt & Joseph, 2004; Premack, 2007). Hierarchical relationships between individuals are ubiquitous among human beings (Fiske, 2010; Magee & Galinsky, 2008). This innate ability to form a social dominance relationship allows one to communicate and interact with others more appropriately and ensure access to resources (Eibl-Eibesfeldt, 1989; Mast & Hall, 2004).

In sum, constructivism claims that morality is learned and developed from the respect for authority figures, whereas naturalism suggests that humans are naturally good and equipped with a moral disposition towards fairness, ingroup loyalty, no-harm/care, reciprocity, and respect for authority. Due to the constraint of research in innate abilities, most empirical studies support constructivism that morality is nurture. For example, Smetana (1981) found that the concept and moral rules emerges in preschool age. Similarly, Turiel (2006) also revealed that not until preschool, children are able to make moral judgement by themselves. However, recent researchers (Baillargeon, Spelke, & Wasserman, 1985; Gummerum, Hanoch, Keller, Parsons, & Hummel, 2010) have developed VOE method and habituation method, and simplified cognitive tasks to study moral understanding of young infants (Baillargeon, Spelke, & Wasserman, 1985). For instance, Wynn and Bloom (2014) suggests that human beings are born with certain moral senses—that young infants can distinguish between good and evil (Premack & Premack, 1997; Smetana, 2006), show

empathy and compassion for others who undergo unfair or injustice treatment (Hamlin, Wynn, & Bloom, 2007), display prosocial behavior (Brownell, 2013; Warneken & Tomasello, 2009), and disapprove disgusting acts (Haidts, Koller, & Dias, 1993). Although these evidence found the emergence of morality from very young, some researchers still argued that infants at such age might have been influenced by the environment (e.g., Damon, 1977). There is still yet a consensus on the origin of morality.

Despite their marked differences, both theories of constructivism and naturalism assume that authority plays an important role in human's moral development—either as a resource that leads to the acquisition of morality or as one of the innate moral principles.

In addition, authority is also one of the key elements used to distinguish the two major categories of morality identified by Turiel (1983). Drawing upon earlier works on social and moral reasoning, Turiel (1983) established a social domain approach to probe the development of moral judgment. He proposes three distinct categories: the psychological domain of concern for self and others, the social domain of social rules and conventions, and the moral domain of justice, rights, and others' welfare. Within the domain of social rules and conventions, Turiel (1983) specifies that there are two types of rules corresponding to morality—moral rules and conventional rules. Researchers (Nucci & Turiel, 1978; Smetana, 1981; Nucci, & Nucci, 1982) commonly characterize moral rules as (1) authority independent (the wrongness of the transgression does not change according to the authority), (2) typically

implicate a victim, and (3) general in scope (applicable to everyone, everywhere). On the other hand, conventional rules are (1) authority dependent, (2) do not implicate a victim, and (3) are local in scope (only applicable to certain situations). Generally, it is suggested that authority has power in explaining and manipulating conventional rules. In other words, if an authority figure violates conventional rules, it is permissible. However, moral rules are stricter than the conventional rules because no one, not even someone in a position of authority, is able to dictate what is or is not morally acceptable although they may be able to dictate what is or is not socially acceptable. Understanding the differences between the two types of rules is important in making moral decisions. Therefore, determining the role of authority in moral context is important in understanding children's moral development.

In addition, authority also plays an important role in in our daily lives. Hierarchy is an omnipresent phenomenon (Fiske, 2010; Magee & Galinsky, 2008). A large body of research has shown that social dominance helps human beings survive and adapt in the natural and social environment (Pellegrini, et al., 2007; Thomsen, Frankenhuys, Ingold-Smith, & Carey, 2011). Social dominance organizes interpersonal behavior by minimizing ingroup aggression and encouraging cooperation within the group to complete tasks (Eibl-Eibesfeldt, 1989; Lorenz, 1966). Moreover, an authority figure helps to promote effective communication among groups (Eibl-Eibesfeldt, 1989).

Based on the importance of authority in moral development as discussed above, it is valuable to look at infants' reasoning about authority figures. Early

representations of authority may reflect the origins of morality and facilitate the learning process of sociomoral reasoning in social interaction. Hence, the present study probes how infants reason about social dominance by investigating their expectations towards authority figures.

### **1.3 Principle of authority**

The concept of authority is also known as social dominance. Haidt and Joseph (2007, p. 384) describe the relationship between the authority and the subordinate as “a two-way street: Subordinates must respect and deference, but superiors must then protect them from external threats and maintain order within the group”. During interactions with others, the individual in dominance tends to prevail when his or her goals conflict with those of another individual (Mascaro & Csibra, 2012; Hand, 1986). In addition, interactions between an authority and subordinate figure often feature unique dynamics of their relationship: (1) the authority figure has control or influence over the subordinate or possesses privileged access to limited resources (Mast & Hall, 2004); (2) subordinate obeys the authority figure’s command (Laupa, Turiel, & Cowan, 1995).

A dominance relationship can be established based on various cues (e.g., physical appearance, dominance and submission behavior, etc.). For adults, physical appearance could be an indicator of dominance. People generally perceive individuals who are taller (Wilson, 1968), older (Berger, Cohen, & Zelditch, 1972), who attract the gaze of others (Chance, 1967), have downward head tilt and lower eyebrows (Mast & Hall, 2004), mature faces

(Montepare & Zebrowitz, 1998), happy, surprised, and angry faces (Montepare & Dobish, 2003), smaller eyes (Keating & Doyle, 2002), and men who wear formal dress (Mast & Hall, 2004), as possessing high social status. In addition, knowledge and ability are also suggested to be indicators of authority (Weisfeld & Weisfeld, 1984). Children consider social position and knowledge to evaluate the legitimacy of authority (Laupa, 1991, 1994), and perceive that people who possess the rewarding power are more likely to be authority (Bandura, Ross, & Ross, 1963). 4- to 7-year-olds use facial expression to judge social power when seeing static pictures (e.g., low eyebrow, not smiling) (Keating & Bai, 1986); By 5 years of age, children are capable of making inferences about dominance by nonverbal cues such as posture, head positioning, and gaze (Brey & Shutts, 2015).

It has been shown that even preverbal infants have the ability to represent a dominance relationship between individuals. Universally, adults are the primary representations of authority for infants (Piaget, 1932). Infants at 10 to 13 months were found to be able to differentiate authority and subordinates by the relative size differences (Thomsen et al., 2011). When two agents are in conflict, infants expect the smaller agent yield to the bigger agent. Mascaro and Csibra (2012) also found that infants can infer a dominance relationship not only on the basis of physical differences and competencies, but also based on the social interaction between individuals (e.g., an agent prevails over another agent in conflicts). Mascaro and Csibra (2012, 2013) found that 12- and 15-

month-olds deem social dominance as a mutual relationship between the authority figure and the subordinate figure rather than as an individual property.

Laupa (1991) proposed that there are three potential factors that influence children's judgment of legitimacy of authority: (1) the attributes of persons giving commands (e.g., age); (2) the authority's position in the specific social context; and (3) the nature of the command. Laupa (1994) examined these three factors among 4- to 6-year-old children. Three stories including authority figures with varying attributes (e.g., age and social position) were presented to children. In the stories, the authority figures intervened in three types of events: the turning taking event (children argue who gets to play first), seating event (children cannot decide where to have snack time), and fighting event (two children are fighting in the yard). Participants were instructed to make judgments and justifications of the legitimacy of and obedience to the authority figure. Children considered the age and social position of the authority when they evaluate the legitimacy of authority commands. In addition, children at all ages preferred the peer authority over the adult non-authority when comparing between a peer who occupies a position of power (e.g., a member of the Disciplinary Committee) and an adult without a formal position of authority, suggesting that children do not solely look at the adult status but also consider the social position of the individual (Laupa, 1994). Moreover, children did not accept commands that fail to prevent harm to third parties by authority figures. Results supported the hypothesis of three factors, indicating that preschool children do not solely conceptualize authority based on their

attributes, but also consider the social context and type of command. Cross cultural research has also been done in Korea to verify the generalizability of this finding (Kim & Turiel, 1996; Kim, 1998).

With regard to human's ability to form social structures of hierarchy, researchers have demonstrated extensively that human beings perform well in recognizing complex social hierarchy (Fiske, 1992; Grosenick, Clement, & Fernald, 2007). With only a glimpse of social interaction, people are able to judge the hierarchical relationship between the individuals at a higher than chance level (Mast & Hall, 2004). Mascaro and Csibra (2013) tested 15-month-olds' capacity to form dominance relationship among three individuals. It was found that infants represent dominance relationship as a single unified structure for all the individuals involved in social interactions rather than isolated relations between pair individuals separately. In addition, infants show sensitivity to linear over circular structure (Mascaro & Csibra, 2013).

Not only can infants represent dominance relationships between individuals, it was also suggested that infants hold different expectations towards the actions of authority and subordinate figures (Mascaro & Csibra, 2012). In one study, 12-month-olds but not 9-month-olds were able to represent dominance between two agents according to the deference behavior of one agent, and perceived it as stable relationship across situations in a VOE paradigm (Mascaro & Csibra, 2012). Infants were first familiarized to an animation in which a dominant agent took an object that the subordinate agent had intended to collect, and the subordinate agent did not take any action and let

the dominant agent succeed. During the test phase, the same agents competed for novel objects. Infants were shown a coherent event in which the dominant agent took the last object while the subordinate agent receded and an incoherent event where the roles were reversed. The results suggested that 12-month-old infants expected the agent who was dominant in the familiarization trial to prevail over the subordinate figure again in a new situation. Therefore, 12-month-olds possess stable expectations towards social interactions between authority figures and subordinate figures.

Children's actions are also guided by authority figures. They accept the command of authority (Damon, 1977; Laupa, 1991, 1994; Laupa & Turiel, 1986) and imitate the behaviors of who possess rewarding power (Bandura, Ross, & Ross, 1963). However, they do not blindly abide by authority but show sensitivity to moral principles. Children only accept parental commands that are consistent with conventional rules but not commands that violate moral rules (Tisak, 1986). Further analysis revealed that children at all ages are able to make appropriate judgment of authority's commands that break moral rules, indicating that children draw boundaries to the commands of authority. Similarly, Laupa and Turiel (1986) tested 7- to 10-year-old children's conception of adult and peer authority by their evaluation of the legitimacy of authority. It was found that participants were capable of recognizing social hierarchy and the legitimacy of authority. However, they only accepted commands by authority figures that were consistent with conventional rules

(e.g., commands related to turn-taking situations) but rejected those commands that violated moral rules (e.g., to continue fighting) (Laupa & Turiel, 1986).

In sum, from the evidence shown above, it was suggested that preschool children and school-aged children not only recognize authority, but also are able to evaluate the legitimacy of authority based on the attributes, social position, and the type of commands. Furthermore, they did not blindly obey commands of authority figures without considering other factors, as opposed to Piaget's (1932) theory that children have a "heteronomous" tendency to agree with authority. Rather, they hold independent moral judgments and selectively accept commands with the consideration of various factors. This supports Turiel's (1983) social domain theory that moral rules are authority independent, even in childhood. However, there is little research on young infants' expectations on the moral behaviors of authority figures. In particular, do infants think authority figures have the privilege to harm others or to violate other moral rules? Or do infants expect the authority figure to follow moral principles? The current study aims to fill in this research gap and shed light on the interactions between different sociomoral principles from a developmental perspective. Particularly, the present study examines the interactions between the principle of authority and the principle of fairness and the principle of care/no harm. The existing research on the principle of fairness and principle of care/no harm will be reviewed extensively in the next two sections.

#### **1.4 Principle of fairness**

The classic view on the development of fairness is that children only adhere to the principle of fairness after 7 to 8 years of age (Damon, 1976). Researchers commonly test children using first-party tasks in a resource distribution paradigm. In first-party tasks, participants are potential recipients of the resources they are asked to distribute, in contrast to third-party tasks, in which they are not allowed to keep any of the resources for themselves. Based on studies using first-party tasks, young children tend to act selfishly in resource allocation tasks and keep most resources for themselves regardless of whether their peers have resources or not (Arsenio & Gold, 2006; Benenson, Pascoe, & Radmore, 2007; Blake & Rand, 2010; Fehr, Bernhard, & Rockenbach, 2008). Even though young children can perform fair behavior sometimes, their sensitivity to fairness is conditional. For example, young children tend to share equally with their parents (Rheingold, Hay, & West, 1976), a peer with whom they have collaborated before (Hamann, Warneken, Greenberg, & Tomasello, 2011; Warneken et al., 2011), and those who have demonstrated prior sharing behaviors with them or others (Olson & Spelke, 2008). Furthermore, 3- to 6-year-old children were found to share with others equally when they received their least favorite sticker but acted selfishly when they received their favorite sticker in a dictator game (Blake & Rand, 2010).

Children become more willing to share their resources with other people and show greater preference for egalitarian allocation of resources as they get older (Blake & Rand, 2010; Fehr, Bernhard, & Rockenbach, 2008). By around

7 years of age, children from western middle-class families are able to share half of their resources with others, including strangers (Blake & McAuliffe, 2011; Fehr et al., 2008; Shaw & Olson, 2012; Thompson, Barresi, & Moore, 1997). Cross cultural studies suggest that children from traditional collective societies, such as China, show sharing behavior with peers and allocate resources equally by the age of 5 (Rochat et al., 2009).

Moreover, although children's reasoning of fairness is first dominant by self-oriented value, they develop a more mature and sophisticated way of thinking over time. Besides being more willing to share their resources fairly with peers, children also develop greater aversion to inequity as they grow older. By about 4 years of age, children show negative emotional responses to unfairness and reject disadvantageous distribution outcomes in which their resources are less than others (Blake & McAuliffe, 2011; LoBue, Nishida, Chiong, DeLoache, & Haidt, 2011). Shaw and Olson (2012) found that 6- to 8-year-olds would rather give up a resource if they could not distribute equally in a third-party task; this tendency to avoid inequity also applied when the children are themselves potential recipients of the resource. In another study, Blake and McAuliffe (2011) designed an economic game to test 4- to 8-year-olds' reactions to two forms of inequality: disadvantageous inequity (receive less than a social partner) and advantageous inequity (receive more than a social partner). Children were offered candies and could either accept or reject the offer. It was found that children at 4- to 7- years old only accepted advantageous offers while rejected disadvantageous offers. In contrast, 8-year-

olds rejected both forms of unequal offer even though they had to sacrifice their own rewards during advantageous offers. When 6- to 8-year-olds watched a fair distributor distribute items fairly to two recipients, versus a generous distributor who gave the same amount of items as the fair distributor to one recipient while giving more to the other recipient, they expressed greater liking for the fair distributor over the generous distributor. This study suggested that older children develop a more mature sense of fairness and value fairness over generosity (Shaw, DeScioli, & Olson, 2012).

However, there is emerging evidence that fairness sensitivities develop much earlier than previously believed. Even pre-verbal infants display a sense of fairness in both resource allocation and reward dispensation paradigms using third-party tasks (see review, Baillargeon et al., 2015). One limitation of first-party tasks in understanding young children's sensitivity of fairness is that such tasks tend to produce outcomes that underestimate children's concept of fairness (Blake, McAuliffe, & Warneken, 2014; Thompson, Barresi, & Moore, 1997). Researchers adopted third-party tasks to investigate children's fairness-related knowledge while avoiding the influence of self-interest. Studies have shown that 15-month-olds but not 12-month-olds show sensitivity to fairness using the VOE paradigm (Schmidt & Sommerville, 2011; Sommerville, Schmidt, & Burns, 2013). Infants were presented with two scenes: equal distribution and unequal distribution. In the movie, two recipients asked the distributor for crackers or milk. The distributor either distributed the items to both recipients equally (equal distribution) or gave one of the recipients more

(unequal distribution). Infants looked longer at the unequal distribution event than the equal event, suggesting that infants as young as 15 months old expected the equal distribution over the unequal outcome. Similar results were found in 19- to 21-month-olds in another live puppet show study (Sloane, Baillargeon, & Premack, 2012). However, recent evidence from eye-tracking study indicates that even 10-month-olds expect agents to distribute resources equally (Meristo, Strid, & Surian, 2016). Moreover, infants' sensitivity to fairness provides expectations of social interactions between the distributor and recipients. In one study, 12- to 18-month-olds displayed preferential looking at a video in which an agent approaches a fair distributor over a video in which an agent approaches an unfair distributor (Geraci & Surian, 2011). This finding suggests that infants predict further social interaction based on distribution behavior. In addition, infants showed preference for the fair distributor after watching the videos, suggesting that infants' sensitivity of fairness also governs their sociomoral reasoning.

Although young children demonstrate a preference for equal distributions of resources, it was previously believed that younger children are not sensitive to contextual information, but rigidly endorsed an equal allocation of resources (Sigelman & Waitzman, 1991). However, recent researchers argued that infants are aware of the context (e.g., merit) within the reward dispensation paradigm (Baumard, Mascaro, & Chevallier, 2012). For example, in the control condition of the study by Sloane, Baillargeon, and Premack (2012), they presented 21-month-old infants with a scene in which one

experimenter distributed rewards equally to two recipients in either one-works condition (only one recipient had done all the work ) or two-works condition (both recipients had done the work). The finding revealed that infants looked longer at the one-works condition than at the two-works condition, suggesting that infants have context-sensitive expectations regarding resource allocations and do not merely expect resources to be divided equally all the time.

Taken together, the above studies suggest that children possess sensitivity to fairness even in the first year of life and that they expect individuals to be fair. In addition, infants' expectation of fairness takes into account the contextual information. However, no study has investigated whether infants take into account the distributor's status in their expectations of fair behavior. Previous studies investigating the principle of fairness assumed that the distributor shared the same status as the recipients, but in real life interactions, the distributor is usually of a higher status (e.g., teacher distributing rewards to students; boss distributing salary to employees). Therefore, in the current study, we aim to investigate the interaction between the principles of authority and fairness. In particular, we examine whether infants expect authority figures to behave fairly.

### **1.5 Principle of no harm**

The principle of no harm states that individuals ought to show care and concern towards others and refrain from unprovoked negative actions (Haidt & Joseph, 2007). One of the premises for showing sensitivity to the principle of no harm is the ability to distinguish positive and negative actions. Premack and

Premack (1997) investigated 12-month-old infants' reactions towards positive and negative actions committed by an inanimate object using the habituation/dishabituation paradigm. During the habituation trials, infants were shown one of the four events repeatedly until they were habituated: (1) *Caress (positive)*: a gray ball follows a black ball and gently touches it; (2) *Help (positive)*: a black ball attempts but fails to pass through a vertical barrier, a gray ball then pushes it so that the black ball successfully passes the barrier; (3) *Hit-vertical (negative)*: a gray ball strikes the top of a black ball, causing the black ball to deform; (4) *Hinder (negative)*: a black ball successfully passes through a vertical barrier and tries to come back to the other side of the barrier, a gray ball prevents the black ball by pushing it away. Looking time across the four habituation conditions was not significantly different. Following the habituation trial, infants were presented with three identical testing trials. The testing trial included a *hit-horizontal (negative)* event: a gray ball strikes the side of a black ball, causing it to deform. Infants from the positive conditions (when previously shown caress and help events) showed recovery in looking time to a greater extent during testing trial than infants from the negative conditions (when previously shown hit-vertical and hinder conditions), suggesting that they were able to distinguish positive from negative actions. Moreover, infants also demonstrated the ability to differentiate positive and negative intention from the same behavior. Behne, Carpenter, Call, and Tomasello (2005) presented 9-month-olds with two agents who attempted to pass a toy to the participant over but failed. One of them was unwilling to hand

the toy while the other was unable to do so. Infants reacted more impatiently towards the unwilling agent than the unable agent, suggesting that 9-month-olds already possess the ability to distinguish positive and negative intention. Taken together, by 1 year old, infants are able to differentiate the valence of actions from the intention of the actions.

However, given the aforementioned finding from Premack and Premack's (1997) study which found that 12-month-old infants looked equally at habituation trials involving help and harm conditions, it appears that infants do not hold expectations of whether individuals ought to be helpful or refrain from harmful behavior (Baillargeon et al., 2015; Premack & Premack, 1997). If infants had expected individuals to act prosocially, they would have looked longer at the harmful event than the helpful event. In another experiment, Kuhlmeier, Wynn, and Bloom (2003) showed 5-month-olds and 12-month-olds movies in which geometric figures engaged in a helpful event and a hinder event. In both movies, a red ball-shaped object attempted to climb up hills. The red ball succeeded in climbing the first hill but failed to reach the second hill. In the helpful event, a green triangle-shaped object pushed the ball to the top of the hill. In contrast, in the hinder event, a yellow square-shaped object pushed the ball down the hill to the bottom of the hill. Again, infants did not show preferential looking time in either of the movies. Therefore, it is suggested that infants do not hold expectations of individuals' social interactions when it comes to prosocial or antisocial behavior.

Nevertheless, it was argued that the geometric characters depicted in the experiments might not be generalizable to infants' expectations of social scenarios. Therefore, Hamlin, Wynn, and Bloom (2007) showed 6- and 10-month-olds the same habituation animation with the same helpful and hinder events except that geometric figures had eyes on them, and therefore were perceived as social agents. The result again showed that infants of both ages looked equally at the two habituated movies. This study replicated the finding of Kuhlmeier, Wynn, and Bloom (2003), suggesting that infants at the first year of life are capable of distinguishing positive and negative events. However, they do not form expectations of how individuals should act positively or negatively.

As soon as infants have the ability to help others, they tend to perform prosocial behaviors towards others, including strangers and ingroup members. At 18 months of age, infants are capable of detecting when strangers need help and provide the necessary help across various scenarios (Warneken & Tomasello, 2006). For example, infants are willing to help individuals who cannot reach objects to achieve their goals (Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011; Svetlova, Nichols, & Brownell, 2010). They do so altruistically, even when they have to spend extra effort and time (Warneken, Hare, Melis, Hanus, & Tomasello, 2007). In addition, infants express signs of empathy when others are harmed. In one study of Vaish, Carpenter, and Tomasello (2009), infants aged 18- and 25-month-old showed distress when they watched an actor being harmed, and subsequently displayed more prosocial behaviors towards the victim actor as compared to those in the control condition. This

study supported the previous research that infants were able to understand the principle of no harm.

Furthermore, infants make social evaluations of individuals who are helpful or harmful. Infants from 5 to 10 months of age prefer the helpful agents over agents that perform harmful actions, and this finding holds for a range of helping and hindering behaviors such as opening a box to get a toy and retrieving a dropped ball (Kuhlmeier et al., 2003; Hamlin, Wynn, & Bloom, 2007; Hamlin & Wynn, 2011). Moreover, 4-year-olds were found to distribute resources favorably to the prosocial agent when provided with an unequal amount of resource for distribution (Kenward & Dahl, 2011).

Therefore, taken together, the findings from the research in early sociomoral reasoning suggest that infants show sensitivity to the principles of care. They are capable of distinguishing positive actions and negative actions as well as consider the intention behind the behaviors. Although infants in general do not expect individuals to act prosocially or to refrain from unprovoked negative actions, they act prosocially towards others and show negative emotion when seeing others under distress. Infants also evaluate helpful and harmful behaviors performed by others, and use the information to predict subsequent interactions between individuals. Furthermore, infants prefer prosocial agents and expect individuals who have been helped or harmed to approach the helper rather than the hinderer. However, it remains unclear whether infants' expectations of authority figures would be governed by the

principle of no harm. Do they expect the authority figure to act prosocially and refrain from negative behavior towards his/her subordinate?

### **1.6 The present study**

Based on the review of current literature, we have established that infants possess sensitivities to fairness and no harm principles, and are able to represent a hierarchical relationship between authority and subordinate figures. However, it remains unclear whether infants' expectations of fairness and care would be affected by the different status of individuals, in particular, if infants have different expectations towards authority figures and subordinate figures. When authority figures have the power to make the final decision even though their decisions might not be in line with universal moral rules, is it necessary for subordinate figures to unconditionally respect the decision? Or do the principle of fairness and the principle of no harm/care outweigh the power of authority? Therefore, the present study explores whether infants form expectations about authority figures in their socialmoral reasoning, and whether their expectations follow the basic principles of moral reasoning—principle of fairness and principle of no harm. Uncovering infants' expectations about how authority figures should act toward subordinate figures will shed significant light on the literature about the role of authority figures in infants' sociomoral reasoning and how it relates to expectations of moral behaviors.

The second purpose of the present study is to contribute methodological innovations to the current literature. One of the innovations is to examine whether infants are able to represent a hierarchical relationship based on

command and obedience behaviors of agents. Given that an authority figure's control over the subordinate and a subordinate's obedience to the command of an authority figure are two characteristics of a dominance relationship, infants should be sensitive to this social interaction and represent dominance relationships between individuals based on command and obedience behaviors (Mast & Hall, 2004; Laupa, Turiel, & Cowan, 1995). However, there is no empirical evidence up to date that infants are able to identify authority and subordinate roles by observing command and obedience behaviors in interactions between agents. Therefore, the current study will also examine this hypothesis by using individuals' command and obedience behaviors as the experimental manipulation to establish authority and subordinate roles. The other innovation is to present infants with real life scenarios. Animated videos have been commonly used in research examining the early development of authority representation. However, to our knowledge, no existing study has been done using real life scenarios to test infants' expectations of the interactions between authority figures and subordinate figures. Although animation has the advantage of being minimalist, and the infant's social knowledge based on previous social experiences would be less likely to act as a source of interference, it may not be able to represent the real world as well as human actors do. Many developmental researchers prefer to present infants with real world situations, which could bring a closer simulation of reality and allow results to be generalized outside of laboratory settings (Frank, Vul, & Johnson, 2009).

Specifically, the present paper seeks to investigate whether i) infants expect an authority figure to behave fairly (Study 1), ii) infants expect an authority figure to help rather than harm her subordinates (Study 2), and iii) infants expect subordinate figures to help rather than harm the authority figure (Study 3). By using the VOE method, we examine infants' reactions when the principle of authority conflicts with the principle of fairness and care in three studies:

Study 1 was conducted primarily to explore whether infants would expect an authority figure to be fair towards subordinate figures. Specifically, would infants find it unexpected when an authority figure is being unfair or selfish? Study 2 was aimed at exploring if infants would expect an authority figure to be helpful towards subordinate figures. Would infants find it unexpected when an authority figure inflicts harm upon a subordinate figure? Study 3 was designed to investigate whether infants would expect a subordinate figure to be helpful towards an authority figure. Specifically, would find it unexpected when a subordinate figure being harmful towards an authority figure?

In Chapters 2-4, I will report the three studies respectively. I will also summarize findings from the three studies and identify the implications and limitations of this research in Chapter 5.

## Chapter 2

# Study 1: Authority and the Principle of Fairness

The purpose of Study 1 is to examine if infants would expect an authority figure to be fair. Specifically, in the current study, infants were presented with a scene in which an authority figure distributes items either fairly (altruistic fair condition), unfairly (altruistic unfair condition), or selfishly (bully condition). If infants were to have an expectation that authority figures should be fair as opposed to being selfish or unfair towards the subordinates, infants would find it more unexpected when they see the authority figure distributing items unfairly or selfishly. Here, it is hypothesized that infants would look longer in the bully condition and the altruistic unfair condition than in the altruistic fair condition.

### 2.1 Method

#### 2.1.1 Participants

Participants were 29 typically developing English speaking Singaporean toddlers ( $M = 24$  months 8 days;  $SD = 4.35$  months; range: 18 months 5 days – 30 months 21 days; 15 boys, 14 girls). 11 of them were in the altruistic fair condition, 8 in the altruistic unfair condition, and 10 in the bully condition. An additional 8 children were tested but excluded from the analysis due to fussiness ( $n = 4$ ) and inattentiveness ( $n = 4$ ). Participants were recruited from

local baby fairs and childcare centers in Singapore. Parental informed consent from all the participants was taken, and approval for the study was obtained from the Institutional Review Board of Nanyang Technological University of Singapore.

### **2.1.2 Apparatus and Materials**

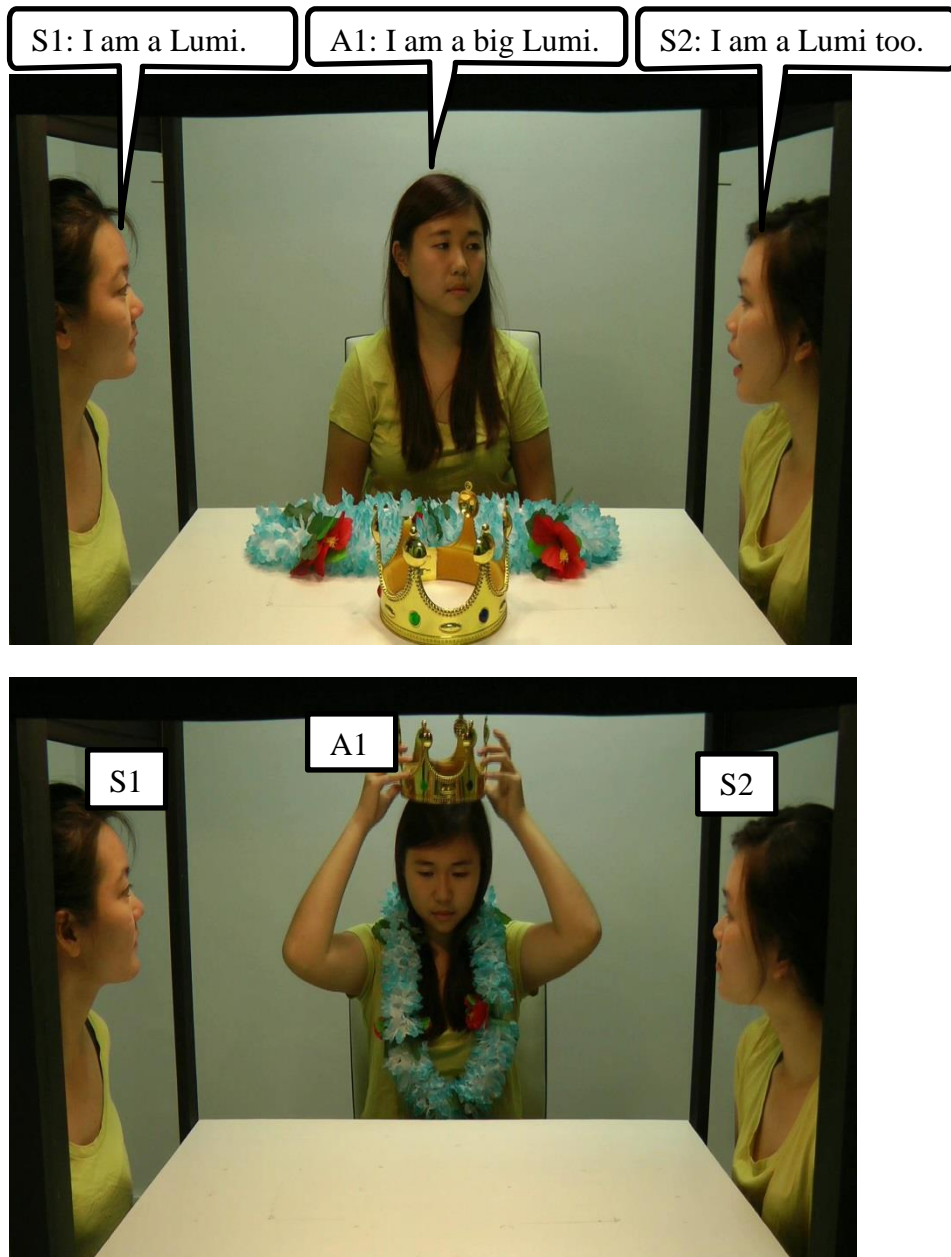
The experiment was conducted in a quiet room of the Early Cognition Lab (Singapore). The stimuli were presented on a 23-inch monitor with a resolution of  $1920 \times 1080$  pixels. A Tobii TX300 eye-tracker was placed directly below the monitor, recording infant's eye-movements (TOBII Technology AB). The procedure is non-invasive and has no known harmful side-effects for participants. The eye-tracking system allows participants to move their head to a large degree, providing a comfortable environment that encourages natural behavior without mounted equipment on the child. Stimuli were programmed and controlled with Tobii Studio (3.4.0) software, and presented on the Tobii monitor. Infant illumination mode was enabled in the current study to improve the tracking accuracy of infants' gaze. The main measurements for the eye-tracker are fixation and fixation duration.

An external webcam was placed directly below the monitor and facing the participant. Video recording provided time stamps in seconds. During the procedure, experimenters were able to discreetly observe the infants' behavior. Two experimenters monitored the infant's looking behavior during the testing session, and infants will proceed on to the next trial if they had looked away for at least 3 seconds.

### 2.1.3 Stimuli

Infants saw 2 labeling trials, 2 familiarization trials, and 3 test trials.

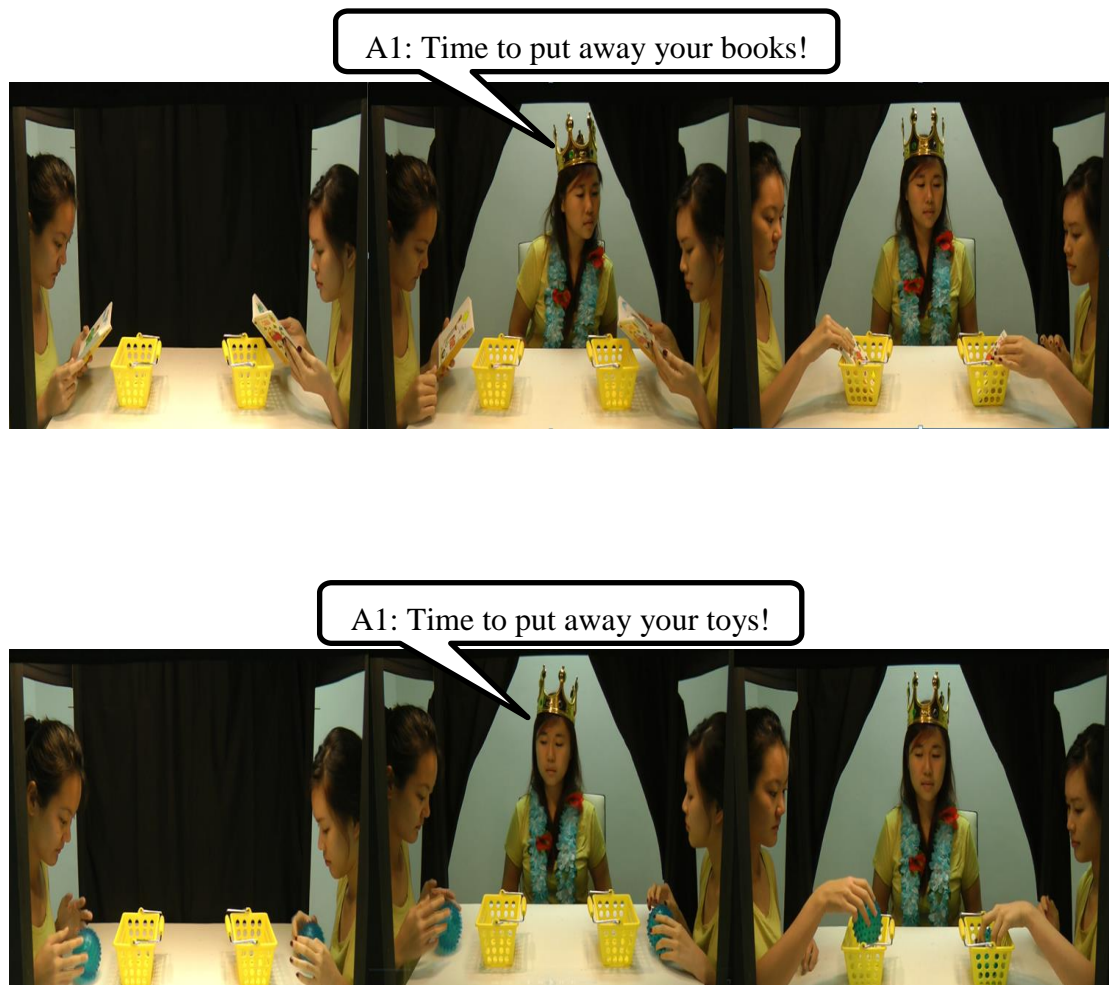
**Labeling trial.** In the labeling trial, three female individuals sat around an apparatus. The apparatus consisted of a brightly lit display booth with a table in the center and large opening in its front, back, and side walls. Inside the apparatus, the side walls had black curtain hanging at the pillar of the wall. The actresses were native English speakers. They wore identical yellow shirts, sitting at the table around the apparatus. The individual on the left (S1) said, "I am a Lumi!", the individual on the right (S2) said, "I am a Lumi, too!", and the individual in the middle (A1) said, "I am a Big Lumi!". Later on, A1 put on a garland and a crown, and the subordinates nodded their heads in response, which further reinforced the dominance characteristics (see Figure 1). The same process of verbalizing their labels was then repeated. Thus, the three individuals were established as belonging to the same group, and A1 was labeled as an authority figure while S1 and S2 were labeled as subordinate figures according to infants' ability to form dominance relationship based on the relative size of the agents (Thomsen et al., 2011). This labeling trial lasted for 22 seconds.



**Figure 1.** Labeling trial

**Familiarization trials.** In the familiarization trials, there were two scenes establishing authority. While S1 and S2 were reading books/playing toys, A1 slid open a black curtain to enter, and looked at the two of them. She then told them that it was “time to put away your (books/toys)”. S1 and S2 nodded their heads and followed her command to put away their books/toys

(see Figure 2). Whether A1 first looked at S1 or S2 was counterbalanced across participants. Each familiarization trial lasted for 22 seconds.



**Figure 2.** *Familiarization trials*

**Test trial.** Participants were randomly assigned to one of three conditions. In each condition, two objects were placed on a transparent tray in the center of the table. S1 and S2 sat in the same position as in the labeling and familiarization trials. A1 entered and positioned herself in the middle, then proceeded to distribute the two objects in the tray, with distribution outcomes differing across three conditions – (i) altruistic fair: the two objects were

distributed fairly between S1 and S2; (ii) altruistic unfair: both objects were distributed to only S1 or S2; and (iii) bully: A1 took both items for herself (see Figure 3). After A1 has distributed all the items, the actresses looked down at their objects. The order in which the objects were distributed (S1 first or S2 first) was counterbalanced across conditions. The test trials in each condition were repeated three times but with different items: toy bananas, toy cars, and toy oranges.



**Figure 3** *Test trials*

#### **2.1.4 Procedure**

Each infant was either seated on a baby chair with a baby booster or on a parent's lap if they were uncomfortable sitting alone, about 60 cm away from the screen. Caregivers either closed their eyes or wore sunglasses during the testing, to avoid influencing their infants' responses. Caregivers were also instructed to avoid directing their child's attention during the study unless the child showed signs of distress. Before starting the formal eye-tracking recording, each participant was brought through a calibration procedure to ensure the accuracy and precision of eye movement recording, during which an

image of a shaking cat with sound flashed in five different location targets on the screen. The infant was allowed to proceed to the next location of the cat only when successful fixation on the present shaking cat was made for more than 1s. The calibration was successful if both of the infant's eyes achieved fixation on all five locations. Upon successful calibration, experimental trials were presented, and the eye-tracker started to record eye-movements of participants.

All infants received two labeling trials (the duration of each trial was 22 seconds), two familiarization trial (each trial lasts for 22 seconds), and three test trials (each trial is divided into two timelines: Timeline 1 (T1) includes the movie time before the second item was distributed, 14 seconds; Timeline 2 (T2) includes the movie time from when the second item was distributed to when the actresses returned to their original position and bowed their heads, 4 seconds). In between the trials, a neutral fixation picture was presented for 2 seconds to recapture the infant's attention, and to signal the start of a new trial. When the participant looked away from the stimuli for more than 3 seconds, or the maximum trial length (18 seconds) was reached, the trial was terminated, and another trial began at the central fixation picture. The webcam video recorded the participant in live time, allowing for the experimenters to monitor each infant's looking behavior to ensure that the infant had looked away from the screen for at least 3 seconds before proceeding on to the next trial.

### 2.1.5 Analytic plan

In the present study, a series of analysis of covariance (ANCOVA) were conducted which compared the looking time in labeling trials, familiarization trials, and the movie in test trials before the items were fully distributed (T1) among three conditions after controlling of age. This is to ensure that participants did not find the video in one condition more interesting than in another condition.

Second, another ANOVA was conducted to compare the looking time during T2 among three conditions. In addition, post-hoc test was also conducted to compare infants' estimated looking time in each condition.

## 2.2 Results

Preliminary analyses using independent ANOVAs yielded no effects or interactions of gender and counterbalanced variables (side to which the actress first looked at (left or right), moved (left or right), or distributed (left or right) on looking time of all the trials, all  $ps > .05$ . Therefore, subsequent analyses were collapsed across these factors.

***Labeling trials.*** Infants' looking times of the two identical labeling trials were averaged. An ANCOVA on infants' averaged looking times at the labeling trials with condition as between-subject variable and age as covariate factor was conducted. The model assumption of homogeneity of regression slopes is assumed. The result revealed no main effect of condition after controlling for age,  $F(2, 25) = 0.29, p = .75, \eta_p^2 = .02$ . The covariate factor, age, was not

significantly related to the looking time,  $F(1, 25) = 0.43, p = .52, \eta_p^2 = .02$ . The marginal estimated mean looking time was 18.07 seconds ( $SE = 0.88$ ) in the altruistic fair condition, 18.71 seconds ( $SE = 1.07$ ) in the altruistic unfair condition, and 19.02 seconds ( $SE = 0.93$ ) in the bully condition. The result suggested that there was no difference in looking times across the conditions in the labeling trials.

***Familiarization trials.*** Two separate ANCOVAs on both familiarization trials with condition as the between-subject variable and age as the covariate factor were conducted. The model assumption of homogeneity of regression slopes is assumed. The results revealed that there was no significant main effect of condition at the  $\alpha = 0.05$  level on infants' looking times to the first familiarization trial [ $F(2, 25) = 0.52, p = .60, \eta_p^2 = .04$ ] and the second familiarization trial [ $F(2, 25) = 0.03, p = .97, \eta_p^2 = .002$ ]. The covariate factor, age, was not significantly related to the looking time in first familiarization trial,  $F(1, 25) = 0.42, p = .52, \eta_p^2 = .02$ ; and second familiarization trial,  $F(1, 25) = 0.18, p = .68, \eta_p^2 = .007$ . In the first familiarization trial, the marginal estimated mean looking time was 14.84 seconds ( $SE = 1.52$ ) in the altruistic fair condition, 17.32 seconds ( $SE = 1.85$ ) in the altruistic unfair condition, and 15.74 seconds ( $SE = 1.60$ ) in the bully condition. In the second familiarization trial, the marginal estimated mean looking time was 16.39 seconds ( $SE = 0.96$ ) in the altruistic fair condition, 16.14 seconds ( $SE = 1.16$ ) in the altruistic unfair condition, and 16.50 seconds ( $SE = 1.00$ ) in the bully condition. This result

suggests that infants did not find the familiarization trials in any condition more interesting than in another condition.

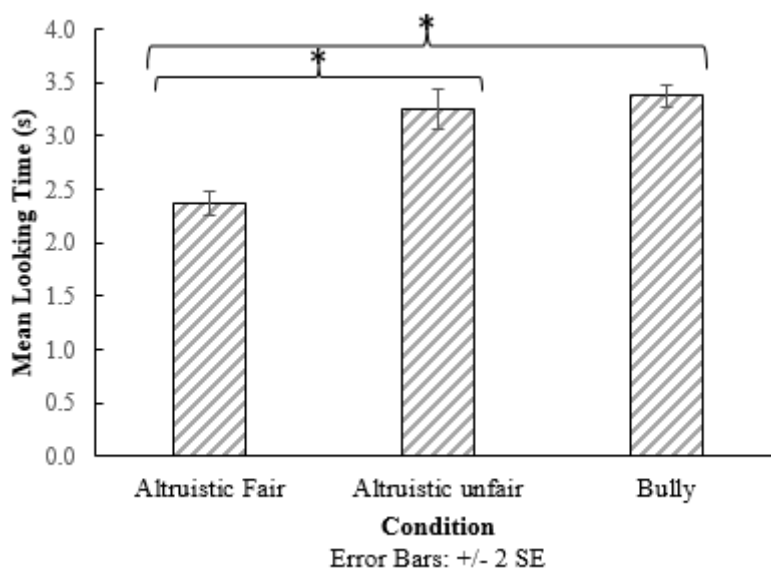
*Test trials.* Among the three trials, due to infants' low attention span, only the trials on which infants looked at the distribution action for more than 50% of the trial ( $\geq 9$  seconds) were averaged and included in the subsequent analyses. 37 out of 87 trials were excluded because of infants' inattentiveness.

An ANCOVA on the looking times during T1 before the second item was distributed with condition as between-subject variable and age as covariate factor was conducted. The model assumption of homogeneity of regression slopes is assumed. The result revealed that there was no significant main effect of condition on looking times at the  $\alpha = 0.05$  level during T1 [ $F(2, 25) = 1.34, p = .28, \eta_p^2 = .10$ ]. The covariate factor, age, was not significantly related to the looking time,  $F(1, 25) = 0.11, p = .74, \eta_p^2 = .004$ . The marginal estimated average looking time during T1 was 11.55 seconds ( $SE = 0.71$ ) in the altruistic fair condition, 11.34 seconds ( $SE = 0.86$ ) in the altruistic unfair condition, and 9.96 seconds ( $SE = 0.75$ ) in the bully condition. The result suggests that looking times before the items were fully distributed did not differ across the conditions.

An ANCOVA on infants' looking times to the distribution outcome during T2 with condition as between-subject variable and age as covariate factor was conducted. The model assumption of homogeneity of regression slopes is assumed. The result revealed a main effect of condition after

controlling for age,  $F(2, 25) = 7.32, p = .003, \eta_p^2 = .37$ . The covariate factor, age, was not significantly related to the looking time,  $F(1, 25) = 0.05, p = .83, \eta_p^2 = .002$ .

Post-hoc test (Bonferroni corrected) revealed that based on estimated marginal means infants looked longer at the altruistic unfair condition ( $M = 3.27$  seconds,  $SE = 0.24$ ) and bully condition ( $M = 3.38$  seconds,  $SE = 0.21$ ) than the altruistic fair condition ( $M = 2.36$  seconds,  $SE = 0.20$ ). There was no significant difference in the looking times between the altruistic unfair condition and bully condition. Infants' looking times to the distribution outcomes across three conditions after controlling for age are depicted in Figure 4.



**Figure 4.** Mean looking times to the distribution outcomes across three conditions. Infants looked significantly longer at the altruistic unfair condition and bully condition than the altruistic fair condition. An asterisk denotes a significant difference between events ( $p < .05$ ).

### 2.3 Discussion

In this study, we investigated whether infants would expect an authority figure to be fair. Our prediction about infants' looking time duration was supported. Overall, our results provide evidence that 1- to 2-years of age generally expect an authority figure to be altruistic and fair.

First, infants in all three conditions were equally attentive to the labeling phase, familiarization phase, and the test phase before the outcome of the distribution, suggesting that participants in all conditions were engaged in the task, and did not vary in attention span. The controls of attention span rule out the possibility that the differences in test trials are due to individual differences.

Second, consistent with the previous finding that infants show sensitivity to the principle of fairness (Schmidt & Sommerville, 2011; Sommerville, Schmidt, Yun, & Burns, 2013), there was a significant effect of condition on looking time at distribution outcomes after controlling for age, suggesting that infants were sensitive to the fair distribution versus unfair distribution and expected fair distribution. In addition, there was no significant effect of age and interaction between condition and age on looking time, suggesting that there are no developmental changes in their expectations towards the distribution outcome. Hence, we find support for the possibility that infants develop moral reasoning about how authority figure should act towards her subordinates by 18 months of age.

Third, further analysis revealed that between the bully condition and altruistic fair condition, infants had reliably longer looking time when the authority took all the objects for herself than when the authority fairly distributed the two items to two subordinates. If infants simply preferred symmetric distribution, there would not be different looking times between the bully condition and the altruistic fair condition since the distribution outcomes from both conditions were symmetric. This suggests that infants expect the authority figure to be altruistic when involving distributing items. As young of 18 months old, infants differentiate the act of being selfish and altruistic, and carry the expectation that authority figures should behave altruistically. In addition, between the altruistic fair condition and altruistic unfair condition, it is also found that infants had significant longer looking time when the authority distributed the objects unfairly amongst the actresses than when the authority distributed items fairly to the two subordinates. This finding suggests that infants expect the authority figure to be fair rather than unfair when distributing items between her subordinates.

Hence, when the principle of fairness and the principle of authority are in conflict, the principle of fairness prevails and infants expect authority to be fair. Our interpretation of this finding is that infants deem an authority figure as a caregiver, which is their primary image of authority figure (Piaget, 1932), and therefore should be prosocial towards the subordinate figures. This finding supports the principle of authority that authority figures must be responsible and protective towards subordinate figures (Haidt & Joseph, 2007).

However, one of the limitations in this study is the lack of validation for the experimental manipulation used in the establishment of authority. There is yet any evidence that infants are able to represent dominance relationship based on the labeling of size and symbols, and obedience behaviors. In our study, it is possible that infants did not deem the target actor as an authority figure and their looking behavior reflected their expectations towards any other individual in general regardless of authority status. Therefore, further studies are needed to address this limitation.

Taken together, the results support the hypothesis that infants expect an authority figure to distribute objects both altruistically and fairly to the subordinate figures. Therefore, the findings in the present study constitute the first evidence that young infants' expectation towards an authority figure is governed by the principle of fairness.

## Chapter 3

### Study 2: Authority and the Principle of No

#### Harm

The purpose of the Study 2 was to examine if infants would expect authority figures to show care towards subordinate figures. Specifically, if infants expect that authority figures should be caring and helpful as opposed to being harmful towards the subordinates, infants would find it more unexpected and look longer when they see the authority figure committing a harmful act on the subordinate. The looking time measures were the same as in Study 1, but pupil diameter was included in Study 2 as an additional source of information given the listed benefits. It is suggested that pupil diameter is a complementary measure that helps to provide richer insight into infants' reasoning (Jackson & Sirois, 2009), and that also addresses limitations related to the VOE method not having support from physiological evidence (Sirois & Jackson, 2012). The pupil dilation, the enlargement of pupil diameter, reliably signals information processing and response to emotional information (Duque, Sanchez, & Vazquez, 2014). Recent studies also start to explore the function of pupil dilation in infants (Hepach & Westermann, 2013; Jackson & Sirois, 2009). For instance, Sirois and Jackson (2012) replicated the study of object permanence with pupil dilation measure in 10-month-olds (Baillargeon, Spelke, & Wasserman, 1985). It was found that infants' pupil dilate larger when they see

interesting or surprising events. 14-month-olds also showed pupil dilation in addition to longer looking time when they see emotion incongruence (Hepach & Westermann, 2013). In addition, 2-year-olds showed pupil dilation when they see others need help (Hepach, Vaish, & Tomasello, 2013). These suggested that dynamic changes of pupil dilation provide a good support to looking time measure and a rich insight to infants' cognitive processing and emotional response. Hence, in the present study, it is hypothesized that toddlers would look longer at the harm condition than at the help condition, and that pupil would dilate larger and pupil dilation would change larger in the harm condition than in the help condition.

### **3.1 Method**

#### **3.1.1 Participants**

Participants were 31 typically developing English speaking Singaporean toddlers ( $M = 27$  months 7 days;  $SD = 4.66$  months; 14 males, 17 females). 17 of them were in the harm condition, and 14 in the help condition. An additional 6 children were tested but excluded from the analysis due to inattentiveness. Participants were recruited from local baby fairs and childcares in Singapore. The study was conducted in the Early Cognition Lab located at KidsSTOP in Singapore Science Centre. Parental informed consent from all the participants was taken, and approval for the study was obtained from the Institutional Review Board of Nanyang Technological University of Singapore.

### 3.1.2 Apparatus and Materials

The apparatus is identical to Study 1. The only addition was that the pupil dilation data from the participant was also recorded. Pupil dilation was measured using Tobii TX300 eye-trackers while participants watched the video stimuli.

### 3.1.3 Stimuli

*Labeling trials & Familiarization trials.* The labeling and familiarization trials followed the same procedure as in Study 1, except that different actresses were in videos.

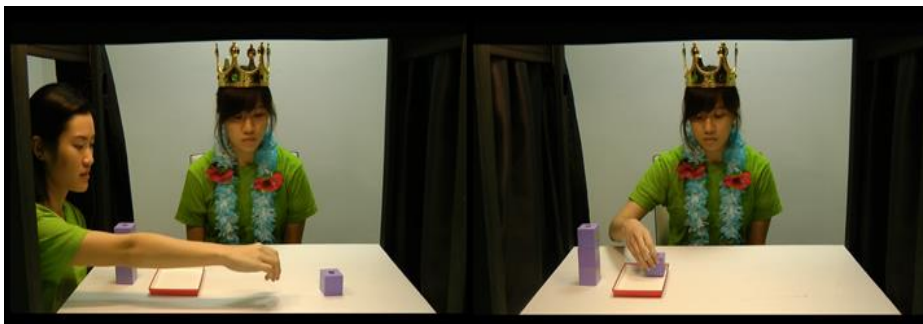
*Test trials.* During the test trials, infants watched either the harm or help condition. Both conditions started with a scene in which the subordinate figure (S1/S2) was stacking tower blocks on the table while the authority figure (A1) watched. There were four blocks on the table. In the:

(i) Harm condition (see Figure 5): All four blocks were in a tray near the subordinate. After the subordinate was done stacking the tower blocks, a bell rang and the subordinate figure said to the authority figure, "Oh, I have to go. I will be back.", and left the scene. A1 subsequently destroyed the tower that her subordinate had built by knocking over the blocks during the absence of the subordinate figure.



**Figure 5.** *Harm condition*

(ii) *Help condition* (see Figure 6): Three of the blocks were in a tray near the subordinate while another block was on the other side of the table and hence was unreachable for the subordinate figure. The authority figure watched as the subordinate figure tried to reach out for the block that was out of her reach, but was unsuccessful and could not finish building the tower of blocks. A bell rang and the subordinate figure said to the authority, “Oh, I have to go. I will be back.”, and left the scene. The authority figure then picked up the unreachable block and helped to place it on the tray within reach of the subordinate figure.



**Figure 6.** *Help condition*

In both the harm and help conditions, the subordinate’s position (left or right side of the authority figure) was counterbalanced.

### **3.1.4 Procedure**

The procedure was identical to Study 1. In order to receive a good measurement of pupil diameter, artificial light with consistent brightness in the testing room was used. Parents were instructed to minimize their infants' head movements. All infants received two labeling trials (each lasts for 22seconds), two familiarization trials (each lasts for 22 seconds), and three test trials (each trial is divided into two timelines: Timeline 1 (T1) includes movie time before the harm/help actions occurred, 28 seconds; Timeline 2 (T2) includes movie time when harm/help actions happened and to when the actresses returned to their original position and bowed their heads, 4 seconds. Infants were randomly assigned to one of two conditions: Harm or Help.

### **3.1.5 Analytic plan**

In the present study, data analyses were conducted in two phases. First, a series of analysis of covariance (ANCOVA) were conducted which compared the looking time in labeling trials, familiarization trials, and the movie in test trials before authority figure harmed or helped the subordinate figure (T1) between harm and help conditions to ensure participants' equal interest in the videos. Another ANCOVA was conducted to compare the looking time during T2 when infants observed the harm or help action between the two conditions after controlling of age. Also, post-hoc test was conducted to compare infants' estimated looking time in each condition.

Second, after setting the baseline of pupil size using first 4 seconds of test trial, we calculated the pupil size change from baseline pupil size to the pupil size during the time when participants watched the harm or help actions. In addition, we also calculated the percentage change in pupil diameter, which is the relative pupil size change as compared to the baseline pupil size. Finally, an ANOCA was conducted to compare the pupil size change as well as the percentage change in pupil diameter between harm and help conditions after controlling of age.

### 3.2 Results

Preliminary analyses yielded no effects or interactions of gender and counterbalanced variables (the side to which the actress first looked at (left or right), moved (left or right), or presented at the test condition (left or right)) on looking time and pupil dilation of all the trials, all  $ps > .05$ . Therefore, subsequent analyses were not stratified by gender and counter-balanced order.

*Labeling trials.* Infants' looking times of the two identical labeling trials were averaged. An ANCOVA on infants' averaged looking times at the labeling trials with condition as between-subject variable and age as covariate factor was conducted. The model assumption of homogeneity of regression slopes is assumed with the data. The result revealed no main effect of condition after controlling for age,  $F(1, 28) = 0.80, p = .38, \eta_p^2 = .03$ . The covariate factor, age, was not significantly related to the looking time,  $F(1, 28) = 0.24, p = .63, \eta_p^2 = .008$ . The result suggested that there was no difference in looking times across the conditions in the labeling trials. The marginal estimated mean

looking time was 19.40 seconds ( $SE = 0.55$ ) in the harm condition, and 18.67 seconds ( $SE = 0.61$ ) in the help condition.

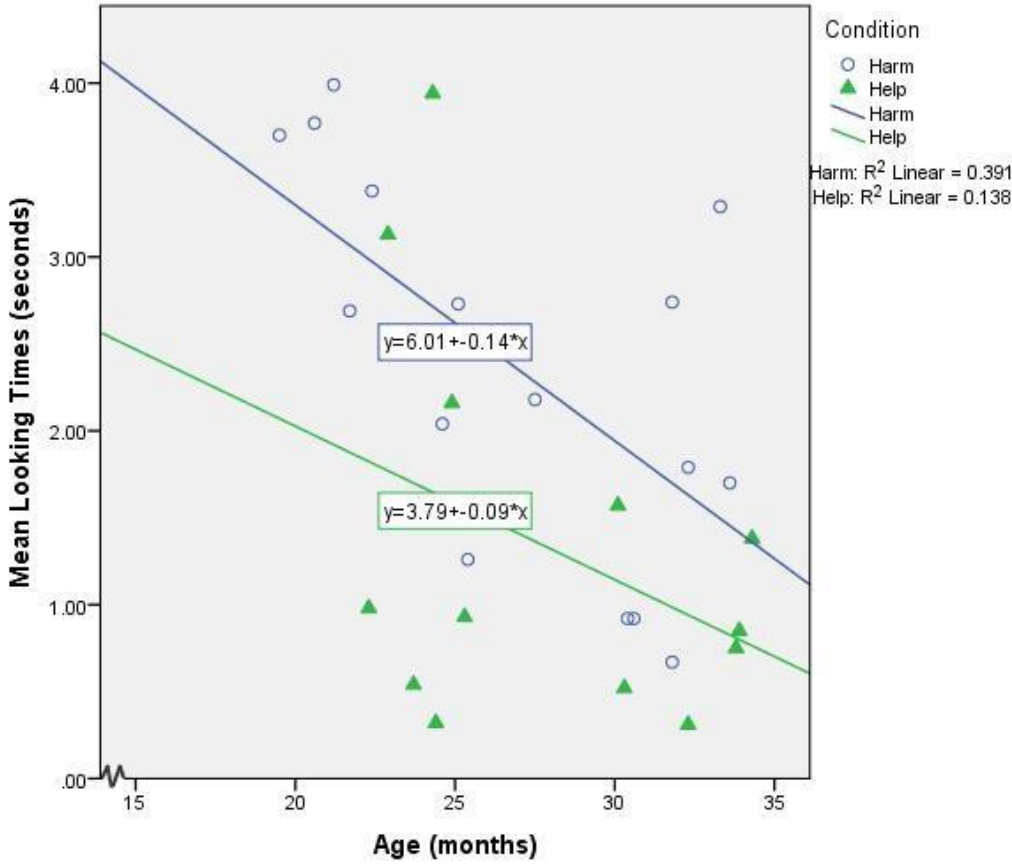
**Familiarization trials.** Two separate ANCOVAs on both familiarization trials with condition as between-subject variable and age as covariate factor was conducted. The model assumption of homogeneity of regression slopes is assumed with the data. The results revealed that there was no significant main effect of condition at the  $\alpha = 0.05$  level on infants' looking times to the first familiarization trial [ $F(1, 28) = 2.74, p = .11, \eta_p^2 = .09$ ] and the second familiarization trial [ $F(1, 28) = 0.003, p = .96, \eta_p^2 = .0001$ ]. The covariate factor, age, was not significantly related to the looking time in first familiarization trial,  $F(1, 28) = 0.13, p = .72, \eta_p^2 = .005$ ; and second familiarization trial,  $F(1, 28) = 0.08, p = .78, \eta_p^2 = .003$ . In the first familiarization trial, the marginal estimated mean looking time was 19.53 seconds ( $SE = 0.87$ ) in the harm condition, and 17.38 seconds ( $SE = 0.96$ ) in the help condition. In the second familiarization trial, the marginal estimated mean looking time was 18.97 seconds ( $SE = 0.71$ ) in the harm condition, and 18.92 seconds ( $SE = 0.78$ ) in the help condition. This result suggests that infants did not show difference in looking times across the conditions in the familiarization trials.

**Test trials.** Among the three trials, due to infants' low attention span, only the trials on which infants looked at the distribution action for more than

50% of the trial ( $\geq 14$  seconds) were averaged and included in the subsequent analyses. 27 out of 91 trials were excluded because of infants' inattentiveness.

An ANCOVA on the looking times during T1 before the second item was distributed with condition as between-subject variable and age as covariate factor was conducted. The model assumption of homogeneity of regression slopes is assumed with the data. The result revealed that there was no significant main effect of condition on looking times at the  $\alpha = 0.05$  level during T1 [ $F(1, 28) = 3.55, p = .07, \eta_p^2 = .11$ ]. The covariate factor, age, was not significantly related to the looking time,  $F(1, 28) = 0.37, p = .55, \eta_p^2 = .01$ . The marginal estimated average looking time during T1 was 24.83 seconds ( $SE = 0.90$ ) in the harm condition, and 22.33 seconds ( $SE = 1.00$ ) in the help condition. The result suggests that looking times before the harm or help action did not differ across the conditions.

Infants' looking times during the final phases of the test trials (T2) were averaged and subjected to an analysis of covariance (ANCOVA) with condition (harm or help) as a between-subjects factor and age as a covariate factor. The model assumption of homogeneity of regression slopes is assumed. The covariate factor, age, yielded a main effect,  $F(1, 28) = 10.09, p = .004, \eta_p^2 = .27$ . The result also revealed a main effect of condition after controlling for age,  $F(1, 28) = 7.55, p = .01, \eta_p^2 = .21$ , suggesting that infants looked longer at the harm event ( $M = 2.33, SE = 0.23$ ) than at the help event ( $M = 1.40, SE = 0.25$ ). Infants' looking times to the distribution outcomes between two conditions, as a function of age, are depicted in Figure 7.



**Figure 7.** Mean looking times to the final phase of harm or help actions across two conditions as a function of age. Infants looked significantly longer at the harm condition than the help condition. Looking times decreased as age increases in both conditions.

**Pupil dilation.** The left and right pupil sizes during the first 4 seconds when the subordinate figure was stacking the blocks were averaged and used as the baseline pupil diameter (BPD). Pupil data from both eyes during the four seconds when the authority figure performed the harm or help action were averaged and used as test pupil diameter (TPD). Pupil size change (C1) was calculated by subtracting pupil diameter during the testing trials from the baseline pupil diameter. In addition, percentage change in pupil diameter (C2) was calculated using the following equation:

$$\%_{\text{change}} = \frac{X_{\text{data}} - \text{baseline}}{\text{baseline}} \times 100$$

Preliminary analysis revealed that there were no significant differences of BPD between harm and help condition,  $t(29) = -.25$ ,  $p = .81$ , Cohen's  $d = 0.08$ . Independent t-tests revealed that there was a significant difference between BPD and TPD in the harm condition,  $t(32) = -7.35$ ,  $p < .001$ , Cohen's  $d = 2.52$ . TPD ( $M = 4.54$ ,  $SD = 0.25$ ) was significantly larger than BPD ( $M = 3.88$ ,  $SD = 0.27$ ). However, there were no significant differences between BPD and TPD in the help condition,  $t(26) = -1.31$ ,  $p = .20$ , Cohen's  $d = 0.50$ . TPD ( $M = 4.34$ ,  $SD = 0.85$ ) was not significantly larger than BPD ( $M = 3.93$ ,  $SD = 0.79$ ).

An ANCOVA [between-subjects factor: condition; covariate: age] on infants' pupil sizes change (C1), was conducted. The model assumption of homogeneity of regression slopes is assumed with the data. There was a main effect of condition after controlling for age,  $F(1, 28) = 8.60$ ,  $p = .007$ ,  $\eta_p^2 = .24$ . The covariate factor, age, yielded no main effect on pupil dilation change,  $F(1, 28) = 0.51$ ,  $p = .48$ ,  $\eta_p^2 = .02$ . Another ANCOVA [between-subjects factor: condition; covariate: age] on infants' percentage pupil sizes change (C2) was also conducted. The model assumption of homogeneity of regression slopes is also assumed with the data. The result revealed a main effect of condition after controlling for age,  $F(1, 28) = 8.40$ ,  $p = .007$ ,  $\eta_p^2 = .23$ , suggesting that there was a significant increase in pupil diameter after the occurrence of harm events ( $M = 0.17$ ,  $SE = 0.02$ ) than help actions ( $M = 0.11$ ,  $SE = 0.02$ ). There was no significant main effect of age,  $F(1, 28) = .11$ ,  $p = .74$ ,  $\eta_p^2 = .004$ .

The significant increase in pupil diameter supports the findings obtained from the fixation duration measures that infants would find it more unexpected when they witness the harm event. Therefore, the pupillary reflex could be seen as a biological reaction in response to the surprising event where the authority figure committed the harmful action.

### **3.3 Discussion**

In sum, Study 2 investigated whether infants expect an authority figure to be caring towards subordinate figures. Infants looked equally at the labeling phase, familiarization phase, and the test phase before the harm or help action, suggesting that participants in all conditions were engaged in the task, and did not show differences in attention span. In contrast, infants looked significantly longer at the harmful behavior by an authority figure than at the helpful behavior in the VOE paradigm. This finding suggests that infants found it unexpected to see an authority figure harms her subordinates by destroying the subordinate figure's blocks. Results of the present study suggest that infants by two and a half years of age already possess the expectation that an authority figure should be caring and not inflict harm. In addition, there is a main effect of age, suggesting that there might be age-related changes.

Furthermore, pupil dilation data was also measured. Therefore, the result that the pupil sizes change was significantly larger in the harm condition than in the help condition is consistent with findings from the looking time measures. It showed that infants had larger emotional responses when they

witnessed an authority figure harming the subordinate, supporting the idea that the harmful behavior of authority violates infants' expectations about authority.

It is worth emphasizing that while previous studies indicate that infants do not generally expect people to be harmful or helpful (Baillargeon et al., 2015; Premack & Premack, 1997), infants in the current study displayed expectations towards an authority figure to be caring towards her subordinates. This result supports the findings that infants can distinguish the positive and negative actions of agents (Hamlin, Wynn, & Bloom, 2010). Furthermore, the current study suggests that infants might have different standards towards authority figures from subordinate figures in terms of events related to the principle of no harm, and expect an authority figure to be caring towards her subordinates. Therefore, the present study suggests that harmful behavior is not permissible even if it is done by an authority figure. Taken together, the present study suggests that infants' expectation about authority figure is under the principle of no harm.

## Chapter 4

### Study 3: Subordinate and the Principle of No Harm

It was found in Study 2 that infants expect an authority figure to be helpful towards her subordinates. There remains a possibility that infants have different expectations towards individuals with different social statuses, and hold individuals in positions of authority interacting with subordinate figures to different moral standards than subordinates interacting with authority figures. Therefore, in order to further examine this hypothesis, Study 3 was conducted to investigate whether infants would expect a subordinate figure to be helpful towards an authority figure. Specifically, Study 3 presented infants with the same labeling and familiarization trials as Study 1 and Study 2. During the testing trials, infants saw the same harm and help events as Study 2 except the roles of authority and subordinate figures were reversed. In the present study, it is hypothesized that infants would find the subordinate harm event more unexpected, and that pupil dilation change would be larger in the harm condition than in the help condition.

#### 4.1 Method

##### 4.1.1 Participants

Participants were 19 typically developing English speaking Singaporean toddlers ( $M = 27$  months 9 days;  $SD = 5.56$  months; 11 males, 8 females), 9 of

them were in the subordinate harm condition and 10 were in the subordinate help condition. An additional 3 children were tested but excluded from the analysis due to inattentiveness ( $n=3$ ). Participants were recruited from local baby fairs and childcares in Singapore. The study was conducted in Early Cognition Lab at KidsSTOP at the Singapore Science Centre. Parental informed consent from all the participants was taken, and approval for the study was obtained from the Institutional Review Board of Nanyang Technological University of Singapore.

#### **4.1.2 Apparatus and Materials**

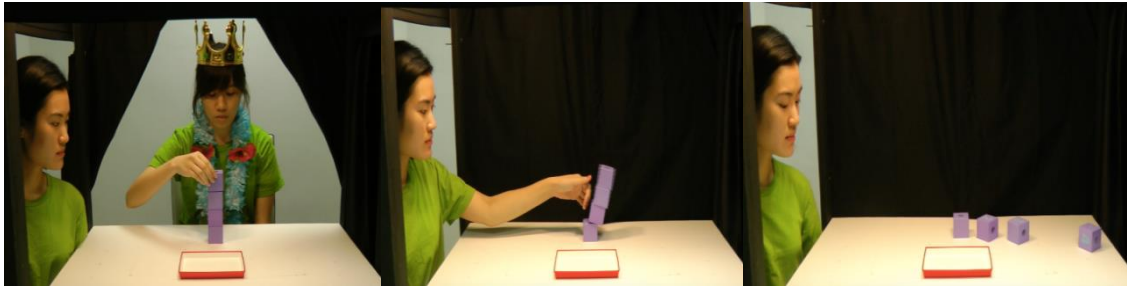
The apparatus is identical to Study 2.

#### **4.1.3 Stimuli**

*Labeling trials & Familiarization trials.* The labeling and familiarization trials were identical to Study 2.

*Test trials.* During the test trial, infants watched either the subordinate harm or subordinate help condition. Both conditions started with a scene in which the authority figure (A1) was stacking tower blocks on the table while the one of the subordinate figures (S1/S2) watched. The other subordinate was not present. There were two conditions.

(i) Subordinate Harm condition (see Figure 8): The movie was identical to the Authority harm condition except that the roles were reversed (i.e., the subordinate figure knocked over the tower that the authority figure had built).



**Figure 8.** *Subordinate Harm condition*

(ii) Subordinate Help condition (see Figure 9): The movie was identical to the authority help condition except that the roles were reversed (i.e., the subordinate figure picked up the unreachable block and helped to place it on the tray within reach of the authority figure).



**Figure 9.** *Subordinate Help condition*

In both the subordinate harm and subordinate help conditions, the position of the subordinate (left or right side of the authority figure) was counterbalanced.

#### **4.1.4 Procedure**

The procedure was identical to Study 2. All infants received two labeling trials (each lasts for 22 seconds), one familiarization trial (each lasts for 22 seconds), and three test trials (each trial is divided into two timelines: Timeline 1 (T1) includes movie time before the harm/help actions occurred, 26

seconds; Timeline 2 (T2) includes movie time when harm or help actions happened and when the actresses returned to their original position and bowed their heads, each lasting 4 seconds). Infants were randomly assigned into one of two conditions: subordinate harm or subordinate help.

#### **4.1.5 Analytic plan**

The analytic plan of Study 3 was identical with the one of Study 2.

## **4.2 Results**

A preliminary ANOVA revealed no effects or interactions of gender and counter balancing on the side to which the actress first looked at (left or right), moved (left or right), or presented at the test condition (left or right) on looking time and pupil dilation of all the trials, all  $ps > .05$ . Therefore, subsequent analyses were collapsed across gender and counter-balanced order.

*Labeling trials.* Infants' looking times of the two identical labeling trials were averaged. An ANCOVA on infants' averaged looking times at the labeling trials with condition as between-subject variable and age as covariate factor was conducted. The model assumption of homogeneity of regression slopes is assumed. The result revealed no main effect of condition after controlling for age,  $F(1, 16) = 0.64, p = .44, \eta_p^2 = .04$ . The covariate factor, age, was not significantly related to the looking time,  $F(1, 16) = 0.15, p = .71, \eta_p^2 = .009$ . The marginal estimated mean looking time was 19.18 seconds ( $SE = 0.72$ ) in the subordinate harm condition, and 19.99 seconds ( $SE = 0.69$ ) in the subordinate help condition. The result suggested that there were no differences

in looking times across the conditions in the labeling trials. The result suggested that there was no difference in looking times across the conditions in the labeling trials.

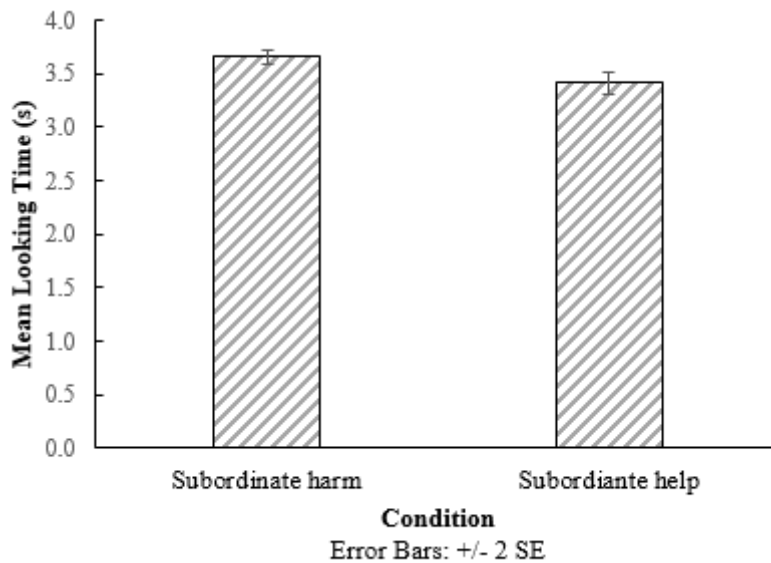
***Familiarization trials.*** Two separate ANCOVAs on both familiarization trials with condition as the between-subject variable and age as the covariate factor were as conducted. The model assumption of homogeneity of regression slopes is assumed with the data. The results revealed that there was no significant main effect of condition at the  $\alpha = 0.05$  level on infants' looking times to the first familiarization trial [ $F(1, 16) = 1.43, p = .25, \eta^2 = .08$ ] and the second familiarization trial [ $F(1, 16) = 0.12, p = .73, \eta^2 = .007$ ]. The covariate factor, age, was not significantly related to the looking time in first familiarization trial,  $F(1, 16) = 0.05, p = .82, \eta^2 = .003$ ; and second familiarization trial,  $F(1, 16) = 0.03, p = .86, \eta^2 = .002$ . In the first familiarization trial, the marginal estimated mean looking time was 16.84 seconds ( $SE = 0.88$ ) in the subordinate harm condition, and 18.30 seconds ( $SE = 0.83$ ) in the subordinate help condition. In the second familiarization trial, the marginal estimated mean looking time was 17.29 seconds ( $SE = 1.23$ ) in the subordinate harm condition, and 17.88 seconds ( $SE = 1.16$ ) in the subordinate help condition. This result suggests that infants did not show difference in the looking times across the conditions in the familiarization trials.

***Test trials.*** Among the three trials, due to infants' low attention span, only the trials on which infants looked at the distribution action for more than

50% of the trial ( $\geq 13$  seconds) were averaged and included in the subsequent analyses. 10 out of 57 trials were excluded because of infants' inattentiveness.

An ANCOVA on the looking time during T1 before the second item was distributed with condition as the between-subject variable and age as the covariate factor was conducted. The model assumption of homogeneity of regression slopes is assumed. The result revealed that there was no significant main effect of condition on looking time at the  $\alpha = 0.05$  level during T1 [ $F(1, 16) = 0.32, p = .58, \eta_p^2 = .02$ ]. The covariate factor, age, was not significantly related to the looking,  $F(1, 16) = 0.02, p = .88, \eta_p^2 = .001$ . The marginal estimated average looking time during T1 was 22.52 seconds ( $SE = 1.08$ ) in the subordinate harm condition, and 21.67 seconds ( $SE = 1.03$ ) in the subordinate help condition.

Infants' looking time during the final phases of the test trials were averaged and subjected to an analysis of covariance (ANCOVA) with condition (subordinate harm or subordinate help) as a between-subjects factor and age as a covariate factor. The model assumption of homogeneity of regression slopes is assumed. The covariate factor, age, yielded no main effect,  $F(1, 16) = 0.007, p = .94, \eta_p^2 = .0004$ . The result also revealed no main effect of condition at the  $\alpha = 0.05$  level after controlling for age,  $F(1, 16) = 1.39, p = .26, \eta_p^2 = .08$ , suggesting that infants looked equally long at the harm event ( $M = 3.66, SE = 0.15$ ) and at the help event ( $M = 3.41, SE = 0.14$ ). Infants' looking times to the distribution outcomes between the two conditions are depicted in Figure 10.



**Figure 10.** Mean looking times to the final phase of harm or help actions across two conditions. Infants looked equally long at the subordinate harm and the subordinate help condition.

**Pupil dilation.** The calculation of the pupil sizes is identical to Study 2. The left and right pupil sizes during the first 4 seconds when the authority figure was stacking the blocks were averaged and set as the baseline pupil diameter (BPD). Pupil data from both eyes during the four seconds when the subordinate figure did the harm or help action and returned back to the original static state were averaged and set as the test pupil diameter (TPD). Pupil size change (C1) and percentage change of pupil diameter (C2) are calculated using the same method as Study 2.

Preliminary analysis revealed that there were no significant differences of BPD between harm and help condition,  $t(17) = -1.09$ ,  $p = .29$ , Cohen's  $d = 0.49$ . Independent sample t-tests revealed that there was a significant difference between BPD and TPD in the subordinate harm condition,  $t(16) = -2.53$ ,  $p$

= .02, Cohen's  $d = 1.19$ ; TPD ( $M = 4.73$ ,  $SD = 0.60$ ) was significantly larger than BPD ( $M = 4.06$ ,  $SD = 0.53$ ). There was also a significant difference between BPD and TPD in the subordinate help condition,  $t(18) = -4.41$ ,  $p < .001$ , Cohen's  $d = 1.97$ ; TPD ( $M = 4.97$ ,  $SD = 0.41$ ) was significantly larger than BPD ( $M = 4.27$ ,  $SD = 0.29$ ). These results indicate that infants were surprised at both subordinate harm and subordinate help events.

We further compared the pupil dilation change between the two conditions. The data met the assumption of homogeneity of regression slopes. An ANCOVA [between-subjects factor: condition; covariate: age] on infants' pupil sizes change (C1), was conducted. The model assumption of homogeneity of regression slopes is assumed. There was no main effect of condition after controlling for age,  $F(1, 16) = 0.01$ ,  $p = .91$ ,  $\eta_p^2 = .001$ . The covariate factor, age, yielded no main effect on pupil dilation change,  $F(1, 16) = 0.13$ ,  $p = .73$ ,  $\eta_p^2 = .008$ .

Another ANCOVA [between-subjects factor: condition; covariate: age] on infants' percentage pupil sizes change (C2), was also conducted. The model assumption of homogeneity of regression slopes is assumed. The result revealed no main effect of condition after controlling for age,  $F(1, 16) = 0.009$ ,  $p = .92$ ,  $\eta_p^2 = .001$ , suggesting that there was no significant difference in pupil diameter change after the occurrence of harm or help action between subordinate harm condition ( $M = 0.17$ ,  $SE = 0.02$ ) and subordinate help condition ( $M = 0.17$ ,  $SE =$

0.02). There was also no significant main effect of age,  $F(1, 16) = 0.19, p = .67$ ,  $\eta_p^2 = .01$ .

### 4.3 Discussion

In this study, we investigated whether infants expect a subordinate figure to be harmful or helpful towards an authority figure in a VOE paradigm. Preliminary analyses indicate that infants share similar attention span. The looking time data during test trials shows that infants looked equally long at the both subordinate harm and subordinate help events. These results point to two possibilities: First, infants in our study were not capable of distinguishing between the harmful and helpful actions. However, past work has demonstrated that 10-month-olds are able to distinguish the harmful actions and helpful actions in a VOE paradigm (e.g., Hamlin & Wynn, 2007; Kuhlmeier, Wynn, & Bloom, 2003). Furthermore, results from Study 2 also showed that infants could discriminate the harmful and helpful actions, and had expectations of authority figures' engagement in the two types of actions. Hence it is unlikely that our result is due to infants' inability to discriminate the two events. Second, infants do not expect subordinate figures to either harm or help the authority figure.

We further examine these possibilities by looking at pupil dilation measures. The results show that infants at both conditions had significant increase in pupil diameter after watching the harm or help action, suggesting that infants were surprised at both events. In addition, there was no significant difference in the percentage change in pupil dilation between the two

conditions, which further supports that infants displayed emotional responses to equal extent at both harm and help actions conducted by the subordinate figure. These results rule out the possibility of the second alternative mentioned above that infants do not have expectations about a subordinate figure's harmful or helpful behaviors. Instead, the findings indicate that infants expect a subordinate figure to avoid both harmful and helpful behavior towards an authority figure. In addition, there is no main effect of age, suggesting that there might not be age-related changes.

Furthermore, the findings of the current study also serve to validate the experimental method used in establishing authority in the labeling trials and familiarization trials. Infants showed different looking patterns and pupil dilation change at the harmful and helpful actions conducted by an authority figure (in Study 2) versus a subordinate figure (in Study 3). Infants looked longer at harmful behavior than helpful behavior when such behaviors were performed by an authority figure, whereas they looked equally at the harmful events and the helpful events acted by a subordinate figure. In addition, infants' pupil size increased significantly after watching an authority figure harm a subordinate figure, but remained the same after watching an authority figure help a subordinate figure. In contrast, when the harmful or helpful behavior was performed by a subordinate figure, infants' pupil size increased significantly from baseline levels in both conditions. These results revealed that infants were able to distinguish the authority figure and the subordinate figure based on the labels and the obedience behaviors.

Taken together, these results demonstrate that infants' reasoning about the social interactions between authority figures and subordinates are governed by the principle of no harm. In addition, we found that infants reason differently about how an authority figure and a subordinate figure interact with each other. They expect an authority figure to be caring towards her subordinates while refraining from negativity. However, infants do not expect a subordinate figure to be either harmful or helpful towards the authority figure. It is possible that infants think that subordinate figures are supposed to listen to the authority figure's instructions before taking any forms of action. Another alternative is that infants do not expect the subordinate figure to touch the authority figure's property without her permission. In addition, a third possibility is that infants deem options of cooperating with and questioning of authority as equally likely options. Further investigation is needed to find out infants' expectation on how a subordinate figure should interact with an authority figure. Generally, infants expect neither an authority figure nor a subordinate figure to be harmful towards others.

## Chapter 5

### Conclusion

This thesis investigates whether infants form moral expectations about authority figures and whether such expectations follow the principle of fairness and principle of no harm. To answer these questions, Study 1 tested whether infants' expectations of an authority figure are governed by the principle of fairness in VOE paradigm. Study 2 examined whether infants possess expectations about authority figures that are consistent with the principle of no harm. Study 3 further investigated whether expectations about how subordinate figures ought to interact with authority figures differ from expectations about how authority figures should treat subordinate figures.

In Study 1, infants were found to show sensitivity to the fairness of an authority figure's actions towards subordinates. They expect authority figures to be fair and altruistic. The findings are consistent with the principle of fairness (Baillargeon et al., 2015) that human beings display a sense of fairness from early in life. In addition, the current results expand the principle of fairness to the realm of social interaction between authority figures and subordinate figures. Infants not only expect authority figures to be fair (distributing one object to each subordinate) but also altruistic (distributing both objects to subordinates and keeping none for the self), suggesting that infants hold stricter moral standards towards authority figures. This expectation might derive from

infants' experience with their social environment. Infants' prototypes of authority figures are generally parents or teachers, who tend to distribute resources altruistically as well as fairly. Therefore, it is possible that children adopt this norm from their observation of adults around them and expect that all authority figures would act in the same manner.

In Study 2, infants were further tested on their sensitivity to the principle of no harm in the context of an authority figure interacting with a subordinate figure. It was shown that infants found it unexpected when the authority figure was unhelpful towards the subordinate figure. This finding supported the previous finding that infants can distinguish the positive actions and negative actions (e.g., Premack & Premack, 1997). However, contrary to the notion that infants do not generally expect individuals to be harmful or helpful (Kuhlmeier, Wynn, & Bloom, 2003), it was found that infants expect authority figures to be helpful towards subordinate figures. It is suggested that infants form different expectations between general individuals without social statuses and authority figures. This result raises the possibility that infants have a potential different standard in their moral reasoning about individuals with different statuses (e.g., authority and subordinate). Therefore, Study 3 further investigated infants' expectations about how subordinate figures interact with authority figures. Infants displayed long looking times at both the subordinate harm and subordinate help conditions, suggesting that they did not expect subordinate figures to either harm or help authority figures. These results

supported the hypothesis from Study 2 that infants apply the principle of no harm differentially towards people with different statuses.

One possible explanation for our findings lies in infants' socialization development. In infants' experiences with social hierarchical relationship, authority figures are always prosocial towards subordinate figures while subordinate figures are respectful towards authority figures. For instance, parents would protect children from external threats while children are taught to respect and to be obedient to parents. As reported by Haidt and Joseph's (2007) theory about the relationship between the authority and the subordinate, authority figures have a responsibility to take care of subordinates. Hence, infants would expect authority figures to abide by moral rules rather than to exercise their privilege of power and get away with wrong doings. On the other hand, from a developmental perspective, infants themselves are considered as subordinate figures, therefore they expect their authority figures—parents or adults, to be caring to them.

As a methodological innovation, it was found in the current research that infants can represent a dominance relationship based on the label of size and symbols, and obedience of subordinate figures to the command of an authority figure. Previous research has also demonstrated infants are capable of distinguishing dominant and subordinate agents from 10 months of age based on the behaviors of bowing and giving way (Thomsen et al., 2011) and submissive reactions to having objects taken away (Mascaro & Csibra, 2012). However, this is the first study that goes beyond the investigation of the

interactions based on salient animation films showing conflicting goals, and further examines social interactions based on verbal cues between dominant individuals and subordinate individuals. In addition, the command and obedience behaviors shown in the present studies are something that would be familiar to children from daily life: a parent or teacher asks the child to put away books or toys. Therefore, it is demonstrated to be a valid establishment for dominance relationship among young infants.

The findings have several theoretical implications: First, contrary to Piaget's (1932) theory that children are not capable of evaluating moral rules and simply follow what adults define what is right and what is wrong, our studies support Turiel's (2008) social domain theory that authority figures do not determine moral rules. Consistent with Tisak's (1986) findings that preschool children considered the types of commands that authority figures give and only accepted commands that follow moral rules, infants in our studies expected moral standards to be authority-independent. Similar patterns were also found in school-aged children. Gingo (2012) found that 6- to 12-year-olds judged deception of teachers and parents unacceptable. Therefore, infants expect authority figures to strictly follow moral standards, in this case, principles of fairness and no harm, rather than that authority figures could get away with committing moral wrongs towards subordinates. On the other hand, infants themselves are not strictly guided by the principles universally, but would consider the contexts in social interactions. For example, infants consider the identity of agents (authority figures and subordinate figures) and possibly

the type of moral principles (moral rules and convention rules) involved. Future studies need to investigate if infants would expect authority figures to define convention rules.

There are several limitations in the present research. First, our age range is slightly wide for developmental studies. Even though the results showed no significant effect of age in Study 1 and Study 3, it is possible due to the relatively small sample size. It is unclear whether there are developmental changes in their reasoning towards authority figures. If yes, what are the changes? Especially during the first two years of life, infants develop quickly (e.g., Hamlin et al., 2007; Mascaro & Csibra, 2012). In addition, there is evidence in Study 2 showing that there are potential developmental changes. Future research needs to explore the possibilities in infants' developing reasoning about the interactions between authority figures and subordinate figures. In addition, the current research is slightly under statistical power due to the relatively small sample size. Hence, future studies should consider increasing the sample size in order to reduce the probability of Type II error and therefore producing more accurate results.

Another limitation is that the study is done in Asia, a conservative culture where authority figures are well promoted and respected (Kim, Kang, & Yun, 2012). Therefore, it remains unclear to what degree these findings could be generalized to other liberal cultures. Future research could examine if the results prove to be robust in Western samples as well. In addition, parenting style is also a potential factor that could influence how infants perceive

authority figures. Therefore, to unveil the effect of cultural and family background is crucial for future studies.

In conclusion, this thesis revealed that infants' moral reasoning is affected by the different status of individuals. Through the three studies, it was found that infants hold different expectations towards authority figure from subordinate figures in their sociomoral reasoning. Infants can represent the dominance relationship between individuals based on how they dress and from their interactions, and expect authority figures to be fair, and avoid harm towards subordinates. These findings shed light on infants' early emergence of sensitivity to social dominance.

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