CHILDREN'S DEVELOPING UNDERSTANDING OF CHOICE ACROSS
CULTURES

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To successfully navigate the world, human beings must identify the choices
they can make as well as the constraints on their choices. These perceptions and
beliefs about choice can be influenced by multiple factors, some of which originate
from the external world (e.g., physical laws, socio-moral norms) and some of which
originate from the internal world (e.g., desires, goals, motivations). Large individual
and cultural variations exist in people's perceptions and beliefs about choices.
Importantly, these views about choice often guide actions, both the regulation of one's
own actions and the interpretation of others' actions. This dissertation presents a series
of studies that investigate how views about choice develop throughout childhood and
across cultures, as well as how these views relate to children's developmental
outcomes — both the regulation of one's own actions and the evaluations of others'
actions. I will discuss the important implications these studies have on children's self-
regulation and goal-pursuit, as well as their social evaluations and moral judgment.

BIOGRAPHICAL SKETCH

Xin Zhao was born and grew up in Yantai, China, received her B.A. in 2014 from Tsinghua University, Beijing, China. She then started to be a graduate student in Human Development at Cornell. During her time at Cornell, she has been working on children's early social cognitive development.

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CHAPTER 1

INTRODUCTION

"I have no choice."

"You do have a choice. And you've made it."

This conversation in *Game of Thrones* happened between Ned Stark and his wife Catelyn Stark right before Ned left Catelyn in Winterfell to start his position as *Hand of the King* in King's Landing. This is a clear example that we think about what choices we have all the time and we constantly contemplate and evaluate on others' choices.

A critical part of being a human is to identify and reason about the choices one has in a certain situation as well as the constraints on his/her choices. One's views about choice and constraints are usually influenced by multiple factors Some factors originate from the external world (e.g. physical laws, socio-moral norms) and some factors originate from the internal world (e.g. desires, goals, motivations etc). For example, when deciding whether to travel all the way to King's landing to take the position of Hand of the King, Ned Stark has to consider the physical situation (the

long distance he needs to travel from Winterfell which is located at the far north of the continent to King's landing which is located at the east coast in the south), the socio-moral situation (the requests from his best friend King Robert Baratheon, and his obligation to his wife who apparently does not want him to leave). His views about choice is certainly also influenced by his own mental states (his goal and motivation to contribute to the development of the country).

Although everyone may share some intuitions about choice and share some desire for autonomous choice, often times there can be large individual variation in people's views about choices. Two individuals may have completely different views about what choices they have and what factors constrain their choices even when they are in completely same situation. Though Ned thinks that he has no choice, implying that he has to obey the order from the King; while Catelyn thinks he has a choice and already made one, implying that he has prioritized the King's order over his family.

Importantly, one's views about choice can often guide one's actions. On one hand, if one believes that she can choose to perform a certain action, she can usually try to regulate herself to act on that choice. However, if one does not believe she can

choose to do that, most likely he/she would not even put into any effort. On the other hand, one's views about choices can also influence how one interprets and evaluates others' actions. People usually consider the alternative options one could have chosen in evaluating his/her actual actions.

This topic on people's views of choice has received much attention in social psychology. There is evidence that adults' views about choice are influenced by the physical situation, the socio-moral factors and individuals' mental states (Baumeister, Vohs, & Tice, 2007; Miller, Das, & Chakravarthy, 2011; Savani, Markus, Conner, 2008). Adults also value the freedom to choose to some extent (Leotti, Iyengar, & Ochsner, 2010; Ryan & Deci, 2000). Moreover, research has shown individual and cultural variation in adults' perceptions of choices, especially that people in different cultures differ on what they view as choices and what factors they would prioritize in decision-making (Iyengar & DeVoe, 2003; Savani, Markus, & Conner, 2010; Miller, Bersoff, & Harwood, 1990; Kitayama, Snibbe, Markus, & Suzuki, 2004). Importantly, people's perceptions of choices have implications both to one's regulations of their actions and their interpretations of others' actions (Vohs & Schooler, 2008; Stillman et

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al., 2010; MacKenzie, Vohs, & Baumeister, 2014).

My interests lie in the developmental roots and the cultural dependency in understanding choices. That is: what are the developmental origins of these understandings of choice? What does a four-year-old perceive to be choices? What factors a child would consider in reasoning about his/her choice? How does individual and cultural variation emerge in childhood? How may children's perceptions of choice may relate to their own actions and their interpretations of others' actions?

To start to answer these questions, I will proceed as follows. In the rest of this chapter, I will review relevant prior work that motivate the current studies. In the following three chapters, I will present empirical studies that center around the investigation of children's understanding of choice across cultures: (1) children's views about choices and constraints from mental desires and the implications these views may have on children's own self-regulatory behaviors across cultures (Chapter 2), (2) how multiple motives (i.e., physical, psychological, socio-moral) and the costliness of choice influence children's social evaluations of others' prosocial decisions (Chapter 3), (3) whether and when children across cultures recognize the

prosociality of giving others the freedom to choose and the socio-cognitive capacities that support this understanding (Chapter 3). In each of these investigations, evidence is found for early-emerging intuitions about choice, as well as interesting developmental change and some cultural variation in early and middle childhood. In Chapter 5, I will summarize and discuss how the findings in these studies may start to unpack children's developing understanding of choice and how these findings contribute to the current literature. I will also outline fruitful directions for future research.

In reviewing the literature, I will first briefly review prior work in social psychology on adults' views about choice, especially the cultural variation and the behavioral implications. I will then review developmental work that motivates the current questions.

### *Adults' Views About Choice Across Cultures*

Large bodies of research in social psychology have investigated adult's views about choices. These works have investigated this topic from multiple dimensions including the degree to which people endorse the freedom to choose (e.g., Paulhus & Carey, 2011; Nadelhoffer, Shepard, Nahmias, Sripada, & Ross, 2014; Baumeister &

Monroe, 2014), the degree to which people construe actions as choices (e.g., Savani, Markus, Naidu, Kumar, & Berlia, 2010), the factors people consider as influencing choices (e.g., DeVoe & Iyengar, 2013) and the degree to which people desire and value the freedom to choose (Leotti et al., 2010; Ryan & Deci, 2000).

Considerable cultural variation, in particular between Western cultures and East Asian cultures, has been shown in many aspects of adults' views about choice. Cultural variation has been shown in what actions people construe as choices and what they think as less of choices (Iyengar & Lepper, 1999; Miller, Das, Chakravarthy, 2011; Markus & Kitayama, 2003; Savani, Markus, Naidu, Kumar, & Berlia, 2010). For example, Savani and colleagues have shown that Americans have a stronger tendency to perceive their everyday actions as choices compared to Indians (Savani, Stephens, & Markus, 2011). When it comes to moral behaviors, Miller and colleagues have shown that U.S. adults typically view the act of helping others as completely a matter of personal choice, Indians instead might view it as an obligation and view it impossible not to help (Miller & Bersoff, 1998; Miller, Bersoff, & Hawrood, 1990). Cultural variation has also been shown in how much one cares about independent vs.

interdependent factors as influencing choices. For example, Westerners tend to view choices as representing and influenced by one's personal preferences and individualistic characteristics, while Easterners tend to view choices as more representing and influenced by interpersonal or socio-moral factors (e.g. others' expectations, social norms etc) (Iyengar & DeVoe, 2003). Generally speaking, these variations are generally consistent with the classic independence vs. interdependence variation shown in other cross-cultural works (e.g., Markus & Kitayama, 1991).

Works with adults have also shown that one's beliefs in free will and perceived ability to choose have implications on a series of behavioral outcomes. Previous studies have shown that the perceived ability to freely choose for oneself is correlated with optimal functioning in various domains: e.g. job satisfaction (Stillman et al., 2010), academic performance (Feldman, Chandrashekar, & Wong, 2016), moral and prosocial behaviors (e.g. Vohs & Schooler, 2008). For example, priming abstract notions of beliefs or disbeliefs in free will have important ramifications in moral behaviors. Priming of disbelief in free will is correlated with increasing immoral behavior, such as lying, cheating, stealing, and aggressive behaviors, racial prejudice,

as well as decreasing prosocial attitudes expressed in altruistic and cooperative behaviors (Vohs & Schooler, 2008, Baumeister, Masicampo, & DeWall, 2009). Similarly, similar manipulation has been shown to weaken intentional inhibition and perceived self-control (Rigoni, Kuhn, Gaudino, Sartori, & Brass, 2012), and reduce the extent to which people hold others responsible for their immoral actions and retributively punish them (Shariff et al., 2014). In another line of research, changing construals of choice in line with future goals helps resist temptation (Fujita & Roberts, 2010; Fujita & Carnevale, 2012; Fishbach & Hofmann, 2015). Manipulating beliefs about "willpower" leads to changes in ego-depletion (Job, Dweck & Walton, 2010).

In summary, individual variation and cultural variation has been shown in adults' views about choice. Beliefs about choice have been shown to have important implications on behavioral regulation in multiple domains.

### Developing Conceptual Knowledge in Early Childhood

Research in developmental psychology has extensively investigated how children make sense of the physical world, the psychological world and the socio-moral world etc. From infancy to preschool years, through hearing and learning from

trusted others (Harris & Koenig, 2006; Koenig, 2012; Sobel & Kushnir, 2013),

through observing and explaining human actions and events (Wellman, 2011; Legare,

2014), as well as through exploration and experimentation (Gopnik & Wellman,

2012), children gradually develop increasingly mature knowledge in these domains

(e.g. Wellman & Gelman, 1992; Schult & Wellman, 1997).

As for the physical domain, there is rich evidence that even young infants have

an intuitive sense of physics, expecting objects to be solid, to fall down if not

supported, and to exist continuously through space and time (Baillargeon, 2004;

Spelke, 1994). There is also evidence that they can consider the physical environment

when making inferences on human actions (Gergely, Bekkering, & Király, 2002;

Brandone & Wellman, 2009).

Children's knowledge of the socio-moral world also emerges early in

development. Even infants demonstrate an early understanding of moral norms (e.g.,

helping and fairness), showing a preference for a helping individual over a hindering

individual (e.g. Hamlin, Wynn, & Bloom, 2007) and expecting someone to share fairly

rather than unfairly (DesChamps, Eason, & Sommerville, 2016; Geraci & Surian,

2011; Sloane, Baillargeon, & Premack, 2012). Toddlers and preschoolers spontaneously protest against violations of social and moral norms in a behavioral task (e.g., Vaish, Missana, & Tomasello, 2011; Rakoczy, Warneken, & Tomasello, 2008; Hardecker, Schmidt, Roden, & Tomasello, 2016) and judge violations of social and moral norms as "not okay" in questionnaire interviews (e.g., Smetana, Killen, & Turiel, 1991; Killen & Smetana, 2006; Yao & Smetana, 2003).

Children's understanding of the psychological world undergoes substantial development in preschool years and middle childhood. A large body of work has investigated children's "folk psychology"—how children understand the beliefs and desires of others (e.g., Wellman, 1992, 2014). By preschool year, children across cultures understand that others can have different desires and beliefs from themselves, and also from the reality; and that one can hide their true emotions (see Wellman, 2014; Wellman, Cross, Watson, 2001; Liu, Wellman, Tardif, & Sabbagh, 2008). Their understanding of the psychological world becomes increasingly sophisticated in middle childhood as children gradually understand the conflicts between mental states and the conflicts between mental states and socio-moral obligations (Lagattuta, 2005;

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Lagattuta et al., 2015)

In summary, by preschool age, children have been equipped with conceptual knowledge of the physical, socio-moral and mental world. They can also explain events and actions with references to knowledge in the appropriate domains (e.g., Hickling & Wellman, 2001; Schult & Wellman, 1997). They may also incorporate these knowledge in their reasoning about choice.

### Children's Reasoning About Choice

Though even infants and toddlers may have some rudimentary intuition of agency and choice (Gergely, Bekkering, & Király, 2002; Brandone & Wellman, 2009), the language development in childhood provides the opportunity to investigate children's explicit views about choice (Nichols, 2004; Kushnir, 2018). A growing body of work investigates how children across cultures explicitly reason about what they themselves and other people can choose to do and cannot choose to do (Kushnir, Gopnik, Chernyak, Seiver, & Wellman, 2015; Chernyak, Kushnir, Sullivan, & Wang, 2013; Kushnir, 2018). These studies show that some basic understanding of what are choices and what are not are already in place very early in development and show little

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cultural variation. Kushnir et al. (2015) shows that children as young as 4 years old understand that they can freely choose to perform simple actions, unless those actions are physically or epistemically constrained (Nichols, 2004; Kushnir et al, 2015). For example, children believe that one can choose to step off or stay on a stool, but one cannot choose to step off a stool and float in the air, and that one could choose to copy a picture that is visible, but not one that is behind a barrier so it cannot be seen. Children in the U.S., Nepal, China and Singapore all make similar distinctions between free actions and physically or epistemically constrained actions (e.g. Chernyak et al., 2013; Wente et al., 2016; Chernyak, Kang & Kushnir, 2019).

In addition to physical or epistemic constraints, researchers have also investigated other more sophisticated motives and constraints that can shift children's reasoning about what are choices and what are not. One important type of constraint comes from internal desires. One may think that internal desires fully constrain what one can choose to do, thus one has to act in accordant with one's desire. However, most adults would actually articulate that even though one might want something badly, one can choose not to fulfill the desire. To investigate children's development

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of such beliefs, Kushnir et al., (2015) told children stories where a story character sees a cookie he/she really likes and asked them whether they think she can choose not to eat the cookie; as well as stories about someone seeing a cupboard that she's really scared of, and asked children whether they think she can choose to look into the cupboard. Such beliefs do not emerge until middle childhood. Four-year-olds view internal desires as constraints on choices, thinking that if someone wants to do something, he/she has to do it. It is not until age 6 or later that children believe that someone can choose to act against or inhibit their desires (US: Kushnir et al, 2015; China: Wente et al, 2016).

Another type of constraint comes from social or moral norms. Using similar methods, research has also asked children in preschool and middle childhood to reason about whether one can choose to act against social or moral norms if they wanted to. For example, in one of the stories, children heard about a story character who wants to hit his friends and were asked if she can choose to do that even though it is morally wrong to do it. They found that young children across cultures do not think one can choose to act against social or moral norms (Chernyak et al., 2013, 2019).

Intriguingly, in middle childhood, children across Western and Eastern cultural contexts diverge in these beliefs (Chenrnyak et al., 2013; Kushnir, 2018). In middle childhood, U.S. children increasingly reason that one can act contrary to social norms and conventions if one has strong desires to do so (Chernyak et al., 2013), whereas Asian children are more likely to say that one has to do the socially or morally right thing and cannot choose to do otherwise (Chernyak et al., 2013; 2018).

These developing understandings of choice aligns well with recent work that reveals the development of more general abilities for imagination (Lane, Ronfard, Francioli, & Harris, 2016), counterfactual reasoning (Sobel, 2004), understanding of possibilities (Shtulman & Carey, 2007; Shtulman, 2009) and future thinking (Atance, 2008). In short, in preschool and middle childhood, children across cultures start to articulate beliefs about choice and alternatives with considerations of physical, internal and socio-moral motives and constraints. Some cultural variation, in particular regarding views about socio-moral constraints, has been shown as children grow up in middle childhood.

*The Current Studies*

Building on these prior work and emerging literature, my dissertation aims to systematically unpack how beliefs about choice develop throughout childhood and across cultures. My dissertation focuses on the implications these beliefs may have on children's developmental outcomes — both the regulation of one's own actions and the interpretations and evaluations of others' actions.

First, do children view about their choices as constrained by their mental desires, and what implications do these beliefs have on their own self-regulatory behaviors? Would the beliefs about choice have similar implications on self-regulation across cultures? In Chapter 2, I will report a study investigating the relationship between children's beliefs about choice and their self-regulation across cultures.

Second, as children get older, children may also begin to recognize different motives for the choices that they and others make, some are external motivations (e.g. social or moral norms) and some are internal ones (e.g. self-interested desires). Along with considering conflicting motivations, children may also understand the costliness of choice, which closely rely on the ability to construe actions in light of possible alternatives that one could have taken. In Chapter 3, I will report a study on how the

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costs one takes in helping others may influence children's evaluation of the actions and how the sources of the costs may influence the judgment.

Third, another important aspect of understanding choice is to recognize that that most people value choice and desire the freedom to choose for themselves. Thus, giving others the freedom to choose is reasonably deemed as more prosocial than leaving no choice for others. In Chapter 4, I will present a series of studies on the development of this understanding in childhood and the socio-cognitive capacities that support this understanding.

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CHAPTER 2

The Relationship Between Children's Beliefs about Choice and Self-Control in

Three Cultures

**Introduction**

Decades of developmental research has revealed important development and

substantial individual differences in children's self-control during early childhood

(Carlson & Moses, 2003; Diamond & Lee, 2011; Mischel, 2014; Mischel & Ebbesen,

1970). Self-control ability measured in early childhood has also been shown to

strongly predict major outcomes later in life. Young children with better self-control

tend to have higher math and literacy scores in kindergarten and elementary school

(Blair & Razza, 2007; Bull& Scerif, 2001), have better social functioning and less

problem behaviors in elementary school (Eisenberg et al., 2001; Eisenberg, Fabes,

Guthrie, & Reiser, 2000), have higher educational achievement and better emotional

coping skills in adolescence (Mischel, Shoda, & Rodriguez, 1989; Mischel, Shoda, &

Peake, 1988; Shoda, Mischel, & Peake, 1990), as well as better finance outcomes, less

criminality and better health in adulthood (Moffitt et al., 2011; Ayduk et al., 2000).

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Considering the individual variability in self-control and its predictive power for future outcomes, much research has been dedicated to identifying influences that can facilitate or undermine children's self-control. For example, teaching children strategies that direct them away from temptations (e.g., distraction from rewards, reframing of the temptation, or creating psychological distance from the temptation) have been shown to facilitate waiting in the face of temptations (Mischel & Ebbesen, 1970; Mischel, 2014; White & Carlson, 2016). Regular intervention activities and curricula (e.g. martial arts and mindfulness practices) at school have also led to promising improvement in children's self-control (Diamond & Lee, 2011).

Recent work has started to investigate another type of influence — intervening on children's theories or beliefs about willpower. Research with adults shows that people differ on their implicit theories about willpower (Job, Dweck, & Walton, 2010). Some think exercising willpower is tiring, while others think it is invigorating. Such beliefs about willpower are also causally related to self-control performance. Adults who think exercising willpower is invigorating are less depleted in tasks that need self-control (Job, Dweck, Walton, 2010; Savani & Job, 2017). One recent study

with preschool-age children also showed that children who were taught about this "invigorating" view of willpower were more successful in a delay of gratification task, suggesting that beliefs about willpower play a causal role in self-control success (Haimovitz, Dweck, & Walton, 2015).

These lines of research raise an interesting question: What are children's own beliefs about self-control, and, especially, how do children's own beliefs about self-control relate to their self-control abilities? In this study, we investigate this link.

What does it mean to believe in the ability to perform self-control? It involves believing that one can choose to refrain from an action despite a strong desire towards it and believing that one can choose to engage in an action despite a strong aversion to it. For example, we adults believe that even though one may really want to eat the yummy cookie on the table, he/she could choose not to eat that cookie. We also believe that even though one may really hate to go to the gym, he/she can choose to go anyways. These beliefs that one can choose to act in ways that oppose one's own desires are part of our adults' beliefs about free will which center around the idea that intentional acts are choices, and, when such actions are not constrained, one can

choose to do otherwise (Monroe & Malle, 2010; Pronin & Kugler, 2010; Nahmais, Morris, Nadelhoffer, & Turner, 2005).

Recent developmental research reveals that some basic aspects of our beliefs about free will are already in place very early in development (Kushnir, Gopnik, Chernyak, Seiver, &Wellman, 2015; Chernyak & Kushnir, 2014; Chernyak, Kushnir, Sullivan, & Wang, 2013; Wente et al, 2016). In particular, children as young as 4 years old believe that they can freely choose to perform simple actions, but they cannot choose to perform actions that violate physical laws or moral or prudential norms (Nichols, 2004; Kushnir et al, 2015, Shtulman & Phillpis, 2017; Chernyak et al., 2013; Kang, Chernyak, & Kushnir, under review). For example, four-year-olds believe that one can choose to step off or stay on a stool, but one cannot choose to step off a stool and float in the air, and one cannot choose to harm other people or harm oneself. Children in the U.S., Nepal, China, Singapore and Peru all make similar distinctions between free actions and actions that are physically or morally constrained (Chernyak et al., 2013; Wente et al., 2016; Chernyak, Kang, & Kushnir, in press; Wente et al., 2017).

Beliefs about free will to inhibit or act against desires are more complex and emerge later in development. Young children see desires as causing or constraining actions, believing that people act in accordance to their desires. They see one's actions as indicative of his/her desires and preferences (Kushnir, Xu, & Wellman, 2010; Repacholi & Gopnik, 1997; Wellman, & Woolley, 1990). As children get older, they develop increasingly complex understanding of desires and beliefs. Preschoolers understand that, in addition to desires, beliefs can also guide actions, and that people can hold false beliefs or beliefs that are different from others. These developing understandings are in general referred to as a developing "theory of mind" (Wellman, 2014). As part of children's emerging 'theory of mind', free will beliefs that one can choose to act differently from desires undergo a further development in preschool and middle childhood. In a recent series of studies, researchers explicitly asked children whether they think someone can choose to refrain from a desired action (e.g. "Can Sally just choose to not eat a yummy cookie?") and whether someone can choose to engage in an undesired action (e.g. Can Sally just choose to eat a bowl of yucky soup?") (Kushnir et al., 2015; Wente et al., 2016). Four-year-olds believe that people

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have to act consistently with their desires and cannot just choose to inhibit or act against desires. It is not until age 6 that children in the U.S. believe that someone can choose to inhibit or act against desires (Kushnir et al, 2015).

These works suggest that children's beliefs about free will undergo important developmental changes at roughly the same time during which self-control (and executive functioning in general) develops (Zelazo & Carlson, 2012; Davidson, Amso, Anderson, & Diamond, 2006; Diamond & Taylor, 1996; Kochanska et al., 1996). A large body of literature has documented that executive functioning is positively correlated with theory of mind development, and this relationship is observed universally in children from both individualistic cultures (e.g. U.S.: Carlson & Moses, 2001; Flynn, O'Malley, & Wood, 2004; Perner, Lang, & Kloo, 2002; UK: Wang, Devine, Wong, & Hughes, 2016) and collectivistic cultures (mainland China: Sabbagh et al., 2006; Hong Kong: Wang, Devine, Wong, & Hughes, 2016). So, similarly, self-control behaviors and free will beliefs about desires may be positively correlated across cultures.

However, looking at the developmental timetables on self-control and free will

beliefs across cultures does not support a culturally universal link between the two. Children from Asian cultures (e.g. China, Nepal and Singapore) have been shown to hold weaker beliefs about free will than U.S. children (Wente et al., 2016; Chernyak et al., 2013; Chernyak et al., 2019). At the same time, however, Asian children (e.g., South Korea, China) have been shown to score higher in executive functioning measures (which includes self-control) compared to their Western counterparts (Sabbagh, Xu, Carlson, Moses & Lee, 2006; Oh & Lewis, 2008). Thus, the relationship between self-control behaviors and beliefs about free will may be more complex than a universal link.

It is possible that the relationship between self-control and free will beliefs about desire may differ across cultures depending on how self-control is experienced in particular cultures. According to cross-cultural work on self-construal and models of agency, people from middle-class North American contexts tend to view agentic actions as stemming from within the individual, for example from one's internal desires; while people from Asian cultures tend to see agentic as responding to the situation, for example to social roles or expectations of other individuals (Kitayama &

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Uchida, 2004; Markus & Kitayama, 2003; Morris, Menon, & Ames, 2001; Miller, Das & Chakravarthy, 2011; Morris & Peng, 1994; Savani, Markus, Naidu, Kumar & Berlia, 2010). Different cultural emphases on self-construals may moderate how self-control is experienced and interpreted in each culture, and further moderate the relationship between free will beliefs and self-control in each culture.

In cultures where people tend to hold independent self-construals (e.g. the U.S.), children may experience and interpret self-control as caused and guided by internal forces (e.g. desires). Thus, children may see successful self-control as evidence for their beliefs in one's ability to act against desires, such that their own self-control would be closely linked to their beliefs about one's free will to act contrary to desires. Experience with self-control, and in particular with regulating internal desires, may lead children to revise an idea that one has to act in accordance to desires into an understanding that one can freely act against desires. Moreover, these beliefs about free will might in turn facilitate self-control (Haimovitz, Dweck, & Walton, 2015). In contrast, in cultures where people tend to hold interdependent self-construals, children may experience and see self-control as caused and guided by

external forces (societal norms, instructions, etc.) rather than internal desires. Thus, they may not incorporate evidence of successful self-control into their free will beliefs about desires, such that their experience of practicing self-control may be independent from their beliefs about free will to act contrary to desires. Instead, their free will beliefs may derive from exogenous sources that are independent of children's own self-control experience. In this case, we may see a close link between free will beliefs and self-control in independence-oriented cultures, but not in interdependence-oriented cultures.

Generally supporting this possibility, recent research shows that children across cultures demonstrate different patterns of behavioral strategies in self-control tasks (Lamm et al. 2017). In a marshmallow task, preschoolers from Western, independence-oriented cultures exhibit more distraction activity (e.g. turning away from the treat or walking away) and emotional display, which reflects their efforts in regulating internal mental states (e.g. desires, feelings). In contrast, preschoolers from non-Western, interdependent cultures wait without much activity or emotional display, which reflects a situational adaptation to the social contexts (Lamm et al., 2017). This

supports the idea that self-construals prioritized in each culture may moderate children's self-control experience.

A recent study (Wente et al., 2017) measuring children's free will beliefs and performance on self-control tasks also provided preliminary evidence for a culturally moderate relationship. They showed that U.S. children revised their beliefs in their own self-control capacities immediately after failures in two self-control tasks (i.e., a toy sort task and a gift wrap task), while no effect was found among children in an interdependent culture (i.e., Peru). In this particular study, children were asked about beliefs about their *own* ability to practice free will rather than a general understanding of another person's ability to act against desires. Previous studies measuring children's beliefs about free will showed evidence that children are in general more optimistic about another person's ability to act against desires than about their own ability (e.g. Wente et al. 2016). Thus, it still remains a question whether children's own self-control experience would also relate to their beliefs about another person's ability to act against desires. In this study, instead of asking children about their beliefs in their own self-control ability, we ask about their general beliefs about a story character's

ability to practice self-control. Furthermore, findings of Wente et al. (2017) may reflect a temporary short-term influence of the self-control tasks. In the current study, we investigate whether there is a general correlation between children's free will beliefs and self-control ability. We also include two additional self-control tasks to make sure the findings are not limited to specific tasks.

In this study, we explicitly test these possibilities by measuring free will beliefs alongside self-control tasks in both the U.S. and two previously studied interdependence-oriented cultures (Singapore, China). We choose to study these three cultures primarily because of our interest in the comparison between cultures with independent self-construals (i.e., U.S.) and interdependent self-construals (i.e., China and Singapore). Additionally, these are the cultures that previous research on children's free will beliefs have focused on (Kushnir et al., 2015; Wente et al., 2016; Chernyak et al., in press).

Historically, mainland China has been considered a collectivistic society where group harmony and social bonds are highly emphasized. With the rapid socioeconomic change after the economic reform in the 1970s, there has been a salient

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rise of individualism-related values (e.g., autonomy and freedom) (Zeng & Greenfield, 2015; Taras et al., 2012; Xu & Hamamura, 2014; Cai, Zou, Feng, Liu, & Jing, 2018). However, some traditional values such as family love, friendship, and social obligations have continued or become even more prioritized in Chinese culture (Zeng & Greenfield, 2015). This will be the first study investigating the relationship between free will beliefs and self-control among Chinese children.

Singapore is characterized by its shared core Asian values amongst its ethnic communities (Quah, 1990) and its Western influences given its colonial history and English-mediated education. Similar to Chinese culture, "collectivist" values of family ties are fundamental, and the group — rather than the individual — is prioritized in Singapore (Kau & Yang, 1991). However, compared with Chinese society, Singaporean society places a stronger emphasis on authoritarian values, which leads to stress on authority, hierarchy, and punishment for rule violations (Connor, 1996). By testing both Chinese and Singaporean children, we are able to compare two Asian cultures which both emphasize social obligations and interdependence, but one is even more authoritarian than the others.

We bring together methods used in research on children's development of free will beliefs and research on children's development of self-control. We choose to study children ages 4 through 8, as this is the age range that previous studies on free will beliefs and self-control have shown developmental changes in these cultures (Kushnir et al., 2015; Chernyak et al., 2013; Sabbagh et al., 2016; Wang et al., 2016). We measure children's free will beliefs by asking them if they believe that a person (a character in a story) can "choose to" act against or inhibit their desires, or whether they "have to" act in accordance to their desires. As a control, we also ask children if a story character can "choose to" perform simple actions, and also if they can choose to act against physical constraints or moral principles (harm, fairness, prudential rules). These questions have been used in previous cross-cultural research, including research with children from China and Singapore (Chernyak et al., 2013; Kushnir et al., 2015; Wente et al., 2016; Kang et al., under review). Second, we measure children's self-control using four tasks (i.e., Gift wrap and Toy sort, Day/Night Stroop and Hearts and Flowers), which all involve inhibiting, delaying or suppressing impulsive or prepotent responses.

We expect to see developmental changes in both free will beliefs and self-control ability in all three cultures. We may also see some cultural variation in free will beliefs and self-control ability. Our critical question is about the relationship between free will beliefs and self-control. If we see a positive relationship between the two in all three cultures, then the relationship may reflect a general relationship between theory of mind and executive functioning. If we see a relationship between free will beliefs and self-control only in the U.S., but not the two Asian cultures, then it would support the hypothesis that self-control may be experienced and interpreted differently across cultures such that it only relates to free will beliefs in the U.S. where regulating mental desires are central to self-control. Alternatively, we might see no correlation between the two measures in any culture.

**Method**

**Participants**

Children from the U.S. ($N = 54$, 3.97-8.90 years old, $M = 6.21$, $SD = 1.36$, 32 girls), China ($N = 72$, 4.39-8.80 years old, $M = 6.39$, $SD = 1.33$, 41 girls) and Singapore ($N = 50$, 4.00-8.58 years old, $M = 6.01$, $SD = 1.29$, 28 girls) were included

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in the final analysis. Six more children were tested but excluded from the analysis due to missing video files ($N = 4$), or experimenter error $(N = 2)$. U.S. participants were recruited from preschools, after school programs, and science museums in Ithaca, NY. They were of predominantly European-American background, ranging from middle to upper-middle class. Singaporean participants were recruited from local preschools and elementary schools. They were all middle to upper-middle class English-Chinese bilinguals. Chinese participants were recruited from preschools and elementary schools in Beijing. They were of predominantly middle and upper-middle class and were of the Han ethnicity. They spoke Mandarin as their native language and started learning English from preschool. We based our sample size in each culture on previous studies using similar tasks and designs (Kushnir et al., 2015; Wente et al., 2016). We matched our sample size in each age group to these previous works and had some more participants because we went for a slightly larger age range in this study.

**Procedure and Measures**

All children were tested individually in a quiet room in homes, local museums, cafes, preschools or elementary schools. Each of the two first co-authors tested

participants in Singapore and China. Each of them tested half the group of participants in the U.S. Each session lasted approximately 20 minutes. Children in the U.S. and Singapore were tested in English while children in China were tested in Mandarin. The English protocol was first translated into Mandarin Chinese by the first author, a native Mandarin speaker, and back-translated into English by another Mandarin-English bilingual research assistant. Another research assistant unfamiliar with Mandarin then compared the back-translation with the original English protocol, to check for accuracy. Differences were revised through discussion.

Each child completed four self-control tasks (Toy Sort, Gift Wrap, Hearts and Flowers, and the Day/Night Stroop task) and two Free Will tasks (a Free Will Desire task measuring children's beliefs in free will to exercise self-control and a Free Will Norm task as a control). Self-control tasks were always administered between the two Free Will tasks, and the order of the two free will tasks was counterbalanced.

**Warm-up phase** Prior to the start of the experiment, each child first completed a warm-up phase. The experimenter asked 4 questions about whether a character can choose to perform simple possible (e.g. smiling if she really wanted to) and impossible

actions (e.g. running faster than a train if she really wanted to). This was to ensure that children understood the questions, and were not simply always answering "yes" or "no". If children answered incorrectly, prompts were given until they responded correctly.

**Self-Control Tasks** Four self-control measures were administered: Toy Sort, Gift Wrap, Hearts and Flowers, and the Day/Night Stroop task. Self-control tasks order was counterbalanced across participants.

*Day/Night Stroop Task.* Children were instructed to say "day" when they saw a card with the moon, and "night" when they saw a card with the sun (Gerstadt, Hong, & Diamond, 1994). Children first completed a training phase where they were given feedback for 6 trials. The test phase comprised 16 cards (i.e. 8 "day" and 8 "night" in the same order across participants). The dependent measure was the accuracy of responses. Two independent coders coded from video recordings, and the reliability between coders was 99%.

*Hearts and Flowers Task.* (Davidson, Amso, Anderson, & Diamond, 2006). Children completed the Hearts and Flowers task on a laptop. The task comprises three

conditions – two congruent blocks (all Hearts, all Flowers) and one mixed block (both Hearts and Flowers). The Hearts condition (12 trials) is a pure-congruent block where participants were asked to press the response button on the same side as the stimulus. The Flowers condition (12 trials) is a pure-incongruent block where participants were asked to press on the response button on the opposite side of the stimulus. The Hearts and Flowers condition (33 trials) is a mixed block condition where both the hearts and flowers stimulus appear together in the same block, and participants have to switch flexibly between same-side and opposite-side rules. The dependent measures were 1) the accuracy of the Flowers block (i.e. incongruent trials) and 2) the accuracy of the Hearts and Flowers condition (i.e. mixed trials).

   *Toy sort Task.* (Denham, Warren-Khot, Bassett, Wyatt, & Perna, 2012). For this task, the experimenter introduced children to 21 enticing toys and three buckets. Children were asked to sort the toys into three buckets according to the color of the stickers pasted on each toy. They were reminded not to play with any of the toys. The dependent measures were 1) time taken to complete sorting the toys and 2) the number of toys each child played with. Performance was coded from video by two coders, and

the reliability between coders was 98%.

*Gift wrap Task* (Kochanska, Murray, Jacques, Koenig, & Vandegeest, 1996). In this task, children were told they would be receiving a gift but that the experimenter had to wrap it first. Children were instructed to turn 90 degrees from the experimenter and not to peek while the experimenter wrapped a gift. The experimenter then wrapped up the gift noisily for 60 seconds. The dependent measure was the time elapsed until children first peeked (i.e. either moving their eyes to sneak a peek or turning their head to peek) during the gift-wrapping phase. Again, two coders independently coded the videos, and the reliability between coders was 88%.

**Free Will Tasks** Each child completed two Free Will tasks - a Free Will Desire task measuring children's beliefs in free will to exercise self-control and a Free Will Norm task as a control. The Free Will Desire task was modeled after Kushnir *et al.* (2015), and comprised 2 control questions (1 simple choice control item and 1 physically impossible control item) and 4 desire items (2 action items and 2 inhibition items). The order of all 6 items was counterbalanced across participants.

In the simple choice control item, children heard a story about a character who

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wanted to undertake a simple choice (e.g., "Peter always uses color pencils to draw his picture but wants to draw his picture with crayon today. Can he just choose to use a crayon or does he have to use a color pencil?"). The impossible control question asked children if they believed a character could choose to do physically impossible things (e.g., "Bobby always walks around the big brick wall but wants to walk right through the wall today. Can he just choose to walk right through the big brick wall or does he have to walk around the wall?"). The order that the 'choose to' and 'have to' options were first presented was counterbalanced within and across participants.

The four desire items consisted two action (desire) items and two inhibition (desire) items (See Table 2.1 for details). The two action (desire) items measured whether children believed that characters in the stories could choose to act against their desires. Each child was asked one question about a food and one about an activity. In the food item, for example, each child was introduced to a story character who really does not like eating crackers (U.S.) or biscuits (Singapore), and were asked, "Even though she does not like it, can Rosie just choose to eat the cracker, or does she have to *not* eat the cracker?" The two inhibition (desire) items measured

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whether children believed that the characters could choose to inhibit themselves from performing a desired action. Again, each child was asked about a food and an activity. In the activity item, for example, each child was introduced to a story character who really wants to look into a box, and were asked "Even though she wants to know about the box, can Sally just choose *not* to look into the box or does she have to look into the box?"). The participants were also asked "why" to explain their responses.

Table 2.1 Examples of desire (action and inhibition) stories used in Free Will Desire Task

|  | Action Items (Food example) | Inhibition Items (Food example) |
| --- | --- | --- |
| Introduction | Let's imagine that there is a cracker/biscuit on the table in front of us. Rosie sees the cracker/biscuit and she doesn't like it. Rosie thinks the cracker/biscuit tastes yucky. | Let's imagine that there is a piece of cereal/cornflake on the table. Sophie sees the cereal and she likes it. Sophie thinks the cereal/cornflake tastes good. |
| Choice | Even though she does not like it, | Even though she likes it, can Sophie |

| Question: | can Rosie **just choose to** eat the | **just choose not to** eat the |
|---|---|---|
| (order of choose | cracker/biscuit, or does she **have** | cereal/cornflake, or does she **have** |
| to/have to | **to not** eat the cracker/biscuit | **to** eat the cereal/cornflake |
| randomized) | | |
| Explanation | Why? | |
| Prompts | | |

The free will norm task was modeled after Chernyak et al. (2013) and acted as a control task in the current study. Children were asked whether the story characters could choose to act against moral or prudential norms. Each child was asked three items – one about harming a friend, one about not sharing with brother, and one about hurting oneself when lifting sister. For example, in the harming item, the child heard "Johnny sees his friends every day. He always plays with his friends nicely. But today, Johnny wants to do something different. Johnny wants to hit his friends." After each scenario, participants were asked (1) an "okay" question – whether it is okay for the character to act against the norm (e.g. "Is it okay for him to hit his friend?") and (2) a

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Choice Question – whether the character can choose to act against the norm (e.g. "Even though it is not nice, can he just choose to hit his friend?").

## Results

To present our results, we will first present descriptive data for all the tasks, followed by analyses for self-control tasks and free will tasks separately. We will then present analyses of the relationship between them.

Descriptive statistics for each Self-control task and each Free Will task split by Culture are summarized in Table 2.2. Preliminary analyses revealed no significant effect of gender or order on the IC or FW measures, we thus combined data in subsequent analyses.

Table 2.2 Descriptive statistics for Self-control, Free Will split by Culture

| | U.S. (N = 54) | China (N = 72) | Singapore (N=50) | |
| --- | --- | --- | --- | --- |
| | Mean (SD) | Mean (SD) | Mean (SD) | Age Effect |
| Age | 6.21 (1.41) | 6.39 (1.33) | 6.01 (1.29) | |
| Self-control Tasks | | | | |

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| | | | | |
|---|---|---|---|---|
| Composite Score (Sum of Standardized Scores of each task) | -.29 (3.29) | -.38 (1.71) | -.02 (2.70) | $r = .53$, $p < .001$ |
| Day/Night Stroop (percent correct) | 86.12 (18.44) | 95.15 (6.89) | 85.59 (18.73) | $r = .36$, $p < .001$ |
| Hearts and Flowers | | | | |
|   Incongruent trials (percent correct) | 85.99 (18.08) | 91.53 (13.28) | 84.87 (17.86) | $r = .28$, $p < .001$ |
|   Mixed trials (percent correct) | 80.64 (17.52) | 85.18 (14.53) | 81.45 (16.96) | $r = .37$, $p < .001$ |
| Gift Wrap | | | | |
|   Latency to 1st peek (sec) | 35.44 (26.05) | 23.63 (21.57) | 27.75 (22.35) | $r = .24$, $p = .001$ |
| Toy Sort | | | | |
|   Time to complete (ms) | 88.57 (51.79) | 88.86 (38.72) | 76.34 (36.65) | $r = -.53$, $p < .001$ |
|   Number of toys played with | 1.85 (3.12) | .64 (1.27) | .78 (1.92) | $r = -.23$, $p = .002$ |
| Free Will Tasks | | | | |
|   Free Will Desire | | | | |
|     Desire Average | .70 (.31) | .78 (.29) | .52 (.33) | $r = .48$, $p < .001$ |
|     Inhibition | .63 (.41) | .72 (.41) | .46 (.44) | $r = .49$, $p < .001$ |
|     Action | .77 | .83 | .57 | $r = .25$, |

|  | (.36) | (.33) | (.42) | *p* = .001 |
| Free Will Control | | | | |
|   Simple Choice | 0.96 | 0.96 | 0.86 | |
|   Impossible | 0.07 | 0.06 | 0 | |
| Impermissible | .27 (.40) | .22 (.33) | .19 (.30) | *r* = .37, *p* < .001 |

**Self-control Tasks**

    All the self-control measures collapsed across cultures formed a reliable scale (Cronbach's alpha = .74). Thus, Self-control Composite Score was formed by summing up the standardized scores on Toy Sort (i.e., average of standardized scores of time to complete and number of toys played with), Gift Wrap (i.e., standardized score of latency to first peek), Hearts and Flowers (i.e., average of standardized scores of accuracy of incongruent block and accuracy of mixed block), and Day/night (i.e., standardized score of accuracy). Higher scores reflect better performance in self-control tasks. The mean Self-control Composite Score was -.29 (SD = 3.29) in the U.S., -.02 (SD = 2.70) in Singapore, and -.38 (SD = 1.71) in China. We ran an ANCOVA with the Composite Score as the dependent variable, culture as a predictor variable and age as a covariate. We found only a main effect of Age, *F(1,165)* =

73.62*, p* < .001(see Figure 2.1). Culture was not a significant predictor. There was also no significant interaction between culture and age. This suggests that children in three cultures scored comparably on the self-control tasks. Across cultures, as children get older, they become better at self-control.
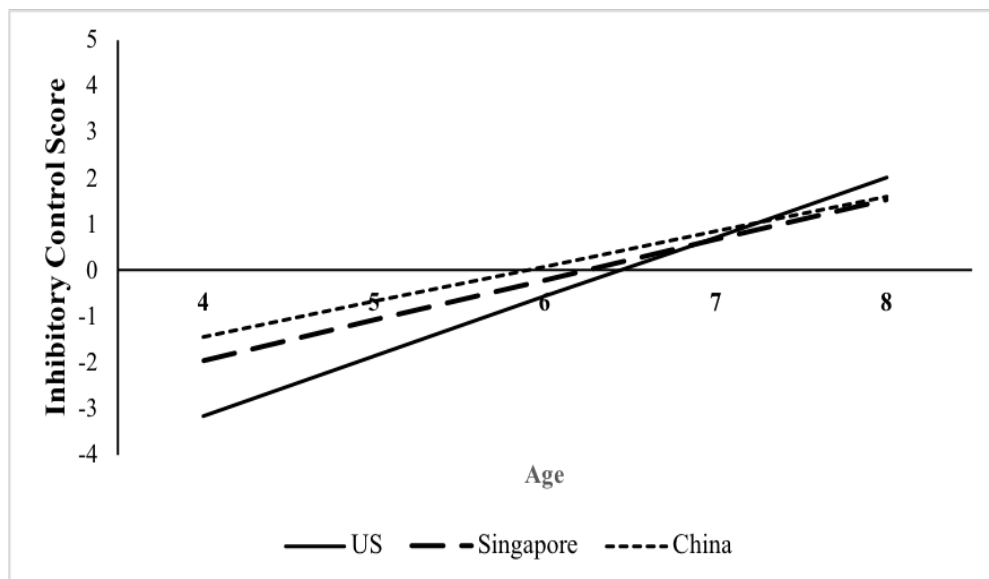


Figure 2.1 Relationship between Self-control score and Age in each culture

**Free Will Beliefs**

The two free will tasks comprised four desire questions (two inhibition desire questions, two action desire questions), and five control questions (one simple choice

control question, one impossible control question, and three impermissible control questions). We first looked at children's answers to the five control questions. As we expected, a significant majority of children in all three cultures answered that the story characters could choose to perform simple action but cannot choose to perform physically impossible actions or morally impermissible actions.[1]

We then focused on children's responses to the free will desire questions. For each question, a child would receive a score of 1 if he/she provided a "choose to" response, and a score of 0 if he/she provided a "have to" response. Since McNemar tests showed no differences between the food item and activity item for any type of questions (i.e., inhibition or action), we averaged their scores for the two inhibition questions to form a Free Will Inhibition Score and averaged their scores for the two action desire questions to form a Free Will Action Score. Also, a Free Will Desire Score was calculated by averaging their scores for all four desire questions. Descriptive statistics can be seen in Table 2.2.

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[1] See Supplementary Material for details.

To investigate potential developmental changes and cultural variation in children's responses to two types of free will desire questions (inhibition and action), we first ran a Repeated Measures MANOVA on children's responses using Question Type (Inhibition, Action) as a within-subject factor, Culture (U.S., Singapore, China) as a between-subject factor, and Age as a covariate. We found a significant main effect of Question Type ($F(1,172)=13.93$, $p < .001$, $\eta_p^2 = .075$), a significant main effect of Culture ($F(2,172) = 9.88$, $p < .001$, $\eta_p^2 = .10$), and a significant main effect of Age ($F(1,172)=45.01$, $p < .001$, $\eta_p^2 = .21$). We also found an Age X Question Type interaction ($F(1,172) =9.64$, $p = .002$, $\eta_p^2 = .05$). For the main effect of Question Type, post hoc tests using Bonferroni corrections revealed that children were more likely to endorse choice for Action items than for Inhibition items ($p = .001$). For the main effect of Culture, Singaporean children provided significantly fewer "choose to" responses than U.S. ($p = .009$) and Chinese children ($p < .001$). For interaction between Age and Question type, follow-up analyses revealed that age was positively correlated with both scores, but the correlation is stronger for Inhibition questions ($r = .48$, $p < .001$) than for Action questions ($r = .25$, $p = .001$).

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We also ran an ANCOVA with FW Desire Average Score as dependent variable, Culture as a between-subject predictor variable and Age as a covariate. The ANCOVA revealed a significant main effect of Age ($F(1,172)=45.01, p < .001$) and a significant main effect of Culture ($F(2,172)=9.88, p < .001$). Older children were more likely to say that people could choose to act against or inhibit their desires than younger children. Singaporean children were less likely to say that people could choose to act against or inhibit their desires than both U.S. and Chinese children but there was no difference between Chinese and US children (Singapore vs. U.S.: $p = .009$, Singapore vs. China: $p < .001$, China vs U.S.: $p = $ n.s). See Figure 2.2 for relationship between Age and Free Will Desire Score in each culture.

Thus, as we hypothesized, we found age-related changes in children's beliefs in free will to practice self-control across three cultures. We also replicated the action bias found in previous studies (Kushnir et al., 2015; Wente et al., 2016) that children were more likely to endorse a choice to engage in an action they did not want to (eat the yucky cracker) than to endorse inhibiting an action they wanted to do (not eat the yummy cereal). We also found cultural variation that U.S. and Chinese children scored

comparably on free will desire tasks, while Singaporean children were less likely than U.S. children and Chinese children to believe that one can choose to act contrary to desires.
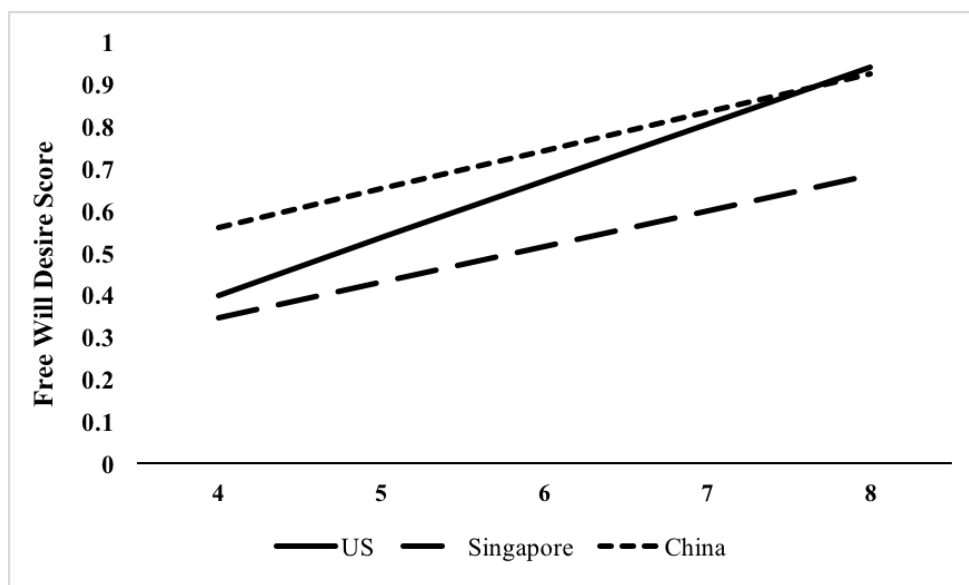


Figure 2.2 Relationship between Free Will Desire score and Age in each culture

**Qualitative Explanations in Free Will tasks**

We coded children's qualitative explanations to the Free Will Desire questions according to the coding scheme adapted from Kushnir *et al.* (2015). Different codings

were assigned depending on whether the child initially gave a "choose to" or "have to" answer. If the children provided "choose to" responses, their qualitative explanations were coded as *alternate internal, alternate external, autonomous*, or *other*. Alternate internal answers referred to hypothetical internal mental conditions, not specified in the story, in which a person would make the alternative choice, whereas alternate external answers referred to hypothetical external conditions in which a person would make the alternative choice.   For example, if the child answered that the character could "choose to" eat the yucky soup, they might further explain that she could choose to do so "because she's curious" (alternate internal), or "because it's healthy" (alternate external). Autonomous answers, in contrast, referred to a person's general ability to make a choice. For example, in response to the question "why can you choose to eat the yucky food" the child might say, "you can choose even if you don't want to" or "she's herself and she can just choose what she wants to do." All answers that did not fit into this coding scheme were coded as "other".

If children initially provided a "have to" answer, their answers to the open-ended questions were coded as *internal constraint, external constraint*, or *other*.

Internal answers referred to mental factors internal to the agent that constrain choice.

External answers referred to factors outside the agent that constrain choice. For

example, if the child answered that Nini "had to" eat the cake, the child might say that

this was so because, "She likes it" (internal) or because, "Cake is good" (external).

Answers that were neither internal nor external, or both internal and external were

coded as other.    Two coders fluent in Mandarin and English coded all children's

explanations. Reliability between coders for qualitative explanations was 91.5%.

Table 2.3 shows the percentage of explanations falling into each category, separated

by response to the Choice Question.

Table 2.3 Percentages of each type of explanation by response to the Choice

Question in each culture

| | Have to | | | Choose to | | | |
|---|---|---|---|---|---|---|---|
| | Internal Constraint | External Constraint | Other | Alternate Internal | Alternate External | Autonomy | Other |
| U.S. | 45.16% (28/62) | 32.26% (20/62) | 22.58% (14/62) | 23.49% (35/149) | 49.66% (74/149) | 8.05% (12/149) | 18.79% (28/149) |

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| China | 55.38% | 35.38% | 9.23% | 18.83% | 68.61% | 0.45% | 12.11% |
|---|---|---|---|---|---|---|---|
| | (36/65) | (23/65) | (6/65) | (42/223) | (153/223) | (1/223) | (27/223) |
| Singapore | 49.48% | 35.05% | 15.46% | 19.61% | 58.82% | 6.86% | 15.6% |
| | (48/97) | (34/97) | (15/97) | (20/102) | (60/102) | (7/102) | (15/102) |

Note: Shading is used to highlight the prevalence of each type of explanation, with darker shades indicating more frequent explanations within each type of response and lighter shades indicating less frequent explanations.

We first looked at children's explanations for why a character *has to* act on her desires. In all three cultures, the most prevalent explanations were internal constraint (U.S.:45.16%, China: 55.38%, Singapore: 49.48%), and then external constraint explanations (U.S.:32.26%, China: 35.38%, Singapore: 35.05%).   we ran a repeated-measures ANOVA on the percentage of each category of explanations each child provided with Category (Internal Constraint, External Constraint) as a within-subject factor and Culture (U.S., China, Singapore) as a between-subject factor. We found a significant main effect of Category ($F(1,104) = 6.88$, $p = .010$), with children across

cultures mentioned more internal constraints (e.g. "she likes it") than external constraints (e.g. "it is yummy") in their explanations. There were no other significant effects.

We then looked at their explanations for why a character can *choose to* act against or inhibit desires. In all three cultures, the most prevalent explanations were alternate external (U.S.:49.66%, China: 68.62%, Singapore: 58.82%), followed by alternate internal (U.S.:23.49%, China: 18.83%, Singapore: 19.61%), then autonomy (U.S.:8.05%, China: 0.45%, Singapore: 6.86%). We also ran a repeated-measures ANOVA on the percentage of explanations each child provided with Category (Alternate Internal, Alternate External, Autonomy) as a within-subject factor and Culture (U.S., China, Singapore) as a between-subject factor. We found a significant main effect of Category ($F$ (2, 320) = 97.03, $p < .001$), showing that, across cultures, children provided more alternative external explanations than alternative internal explanations ($p < .001$), and more alternative internal explanations than autonomy explanations ($p < .001$). There were no other significant effects. Thus, we replicated the patterns of explanations in previous studies (Kushnir et al., 2015; Wente et al.,

2016) that children predominantly refer to internal constraints when explaining why someone *has to* act on her desires and refer more to alternative external conditions when explain why someone can *choose to* act against desires.

### Relationship Between Free Will Beliefs and Self-control

Our critical question was whether free will beliefs relates to self-control and how it does across cultures, we ran a linear regression on Self-control Composite Score with Age, Culture, Free Will Desire Score and the interaction between Culture and Free Will Desire Score, with U.S. children as the reference group. The results are summarized in Table 2.4. Among U.S. children, Free Will Desire Score significantly predicted their Self-control Composite Score, that those children who held stronger beliefs in free will to act against or inhibit desires also performed better in the self-control tasks ($b = 4.52$, $t(161) = 4.27$, $p < .001$). We also found a significant interaction between Culture and Free Will Desire score. Specifically, the effect of free will beliefs on self-control performance was significantly larger among U.S. children than Chinese children ($b = -4.75$, $t(161) = -3.67$, $p < .001$) or Singaporean children ($b$

= - 4.60, *t(161)* = -3.87, *p* < .001)[2]. We then ran partial correlations between Self-control Composite Score and Free Will Desire Score (controlling for age) in each culture, and found that the two was positively correlated only in the U.S. (*r* = .43, *p* = .002), but not in Singapore (*r* = -.17, *p* = .29) or China (*r* = -.05, *p* = .68). See Figure 2.3 for the relationship between Self-control Score and Free Will Desire Score (after controlling for age and cultural effects) in each culture.

Table 2.4 Standardized Regression Coefficients from Multiple Regressions of Variables predicting Self-control Composite Score, individual self-control task (U.S. as the reference group).

| Dependent Variable | Self-control Composite | Day/Night | Hearts & Flowers | Gift Wrap | Toy Sort |
|---|---|---|---|---|---|
| Age | .41*** | .30*** | .28** | .20* | .33*** |
| Mean difference between Singapore and U.S. | .71*** | .42* | .56** | .020 | .68** |

[2] Similar results were found when outliers in the Self-control tasks were removed from analyses.

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| | | | | | |
|---|---|---|---|---|---|
| Mean difference between China and U.S. | .77*** | .82*** | .82*** | -.19 | .68** |
| Relationship between Self-control and Free Will Desire in U.S. | .54*** | .38** | .50** | .19 | .49** |
| Slope difference in the Free Will/Self-control/ relationship between Singapore and U.S. | -.65*** | -.41* | -.50** | -.13 | -.41* |
| Slope difference in the Free Will/Self-control relationship between China and U.S. | -.80*** | -.65** | -.79** | -.09 | -.67** |
| $R^2$ | .36*** | .26*** | .23** | .12* | .26*** |
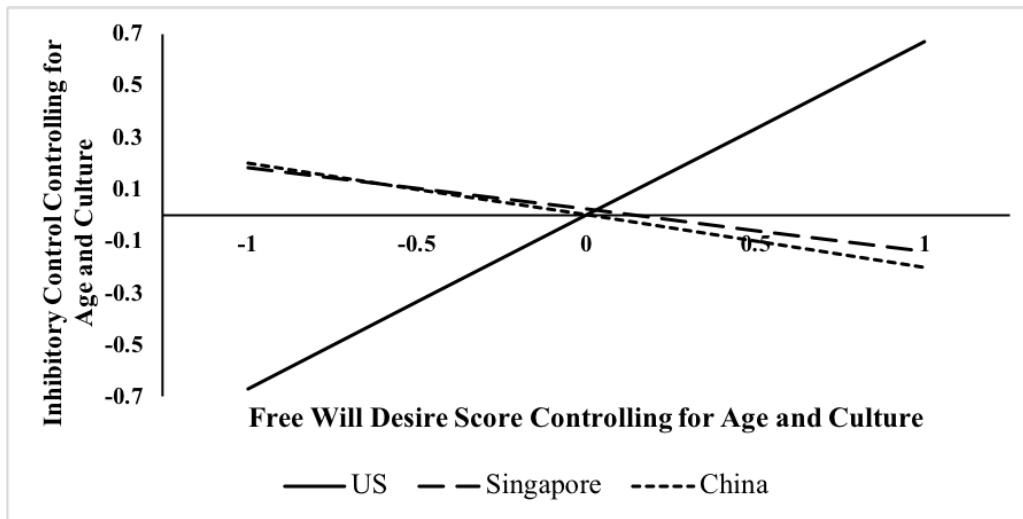
Figure 2.3 Relationship between Free Will Desire Score and Self-control Score in each culture after controlling for Age and Cultural differences.

We conducted additional analyses to examine the individual predictive relationships between the Free Will task and each self-control task.   This was to ensure that the cultural moderation we found was not an artifact of slight differences in reliability between the self-control asks across cultures (U.S. IC data was more intercorrelated than Singapore and Chinese data, as shown above). We ran linear regressions on each individual Self-control task with Age, Culture, Free Will Desire

Score and the interaction between Culture and Free Will Desire Score. We found the same result for the individual predictive relationships as we did for the composite score, as shown in Table 2.5. Follow-up partial correlations between each individual Self-control task (Hearts & Flowers, Gift wrap, Day/Night Stroop and Toy Sort) and Free Will Desire Score controlling for age within each culture are shown in Table 2.5. The individual analyses supports the finding above that free will beliefs are correlated with self-control performance only for U.S. children but not for children in Singapore and China.

Table 2.5 Partial correlations between Free Will Desire Score and Self-control Composite Score and individual self-control task controlling for age in each culture

|  | U.S. | Singapore | China |
| --- | --- | --- | --- |
| Composite Score | .43** | -.17 | -.05 |
| Day/Night | .26$^\dagger$ | -.27 | -.064 |
| Hearts & Flowers | .45** | -.22 | -.14 |
| Toy Sort | .39* | .03 | -.064 |
| Gift Wrap | .18 | .05 | .18 |

As a control, we also checked for the relationship between children's responses to the free will control questions and their Self-control Score. We ran three regressions (one for simple choice item, one for impossible items, one for impermissible items) on children's responses to the free will control questions with Age, Culture, Self-control score as predictors. We found no significant effect of Self-control Score for any question ($p$'s = n.s.). Thus, as we expected, children's basic ability to respond to questions about possibility, impossibility, and permissibility are not related to their self-control performance.

Relationship between qualitative explanations and self-control

For children in each culture, we ran bivariate correlations between their Self-control Composite Score and the number of each category of explanations they provided. For U.S. children, Self-control Composite Score is positively correlated with the number of alternate external explanations ($r = .43$, $p = .001$) and autonomy explanations ($r = .29$, $p = .035$), but not correlated with the number of alternate internal explanations ($r = .20$, $p = .14$). Also, Self-control Composite Score is negatively correlated with both the number of internal explanations ($r = -.36$, $p = .008$)

and external explanations ($r = -.48$, $p < .001$).

For Chinese and Singaporean children, there is no significant correlation between their explanations following "choose to" responses and their self-control performance. However, the number of external constraint explanations (following "have to" responses) was negatively correlated with their Self-control Composite score (Singapore: $r = -.32$, $p = .041$; China: $r = -.24$, $p = .043$).

**General Discussion**

The current study was the first to explore the relationship between children's beliefs about free will and their self-control behaviors across cultures. Replicating previous studies (Kushnir et al., 2015; Wente et al., 2016; Chernyak et al., 2013; Carlson, Diamond etc), both free will beliefs and self-control behaviors develop over time in all three cultures. In introduction, we stated two possibilities regarding the relationship between free will beliefs and self-control. One possibility was that, just like the correlation between theory of mind and executive functioning, free will beliefs and inhibitory control may also be linked across cultures. The other possibility was that cultural emphases on self-construals may impact the way that self-control is

experienced in each culture, and this in turn moderates the relationship between self-control behaviors and free will beliefs about desires. Our results lend support to the latter possibility. After controlling for age differences and cultural differences, free will beliefs were positively correlated with self-control only among U.S. children, but not among Singaporean or Chinese children. The cultural-moderated relationship suggests that the development of self-control and free will beliefs may unfold differently across cultures.

In the U.S. where independence is emphasized, children may experience and view self-control as internally caused, thus their self-control behaviors and free will beliefs about desire are closely linked. Although our findings are correlational, recent studies suggest that the relationship may be bi-directional. Experience with self-control, and in particular with internal conflict, may lead children to modify their belief about whether desires can be controlled. For example, immediately after a series of self-control failures in a lab setting, children revise their beliefs in their own self-control capacities (Wente et al., 2017). In the other direction, free will beliefs about desire might also facilitate self-control behaviors. For example, learning that "the will"

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is not a finite resource allows children to wait longer for later rewards in the marshmallow task (Haimovitz, Dweck, & Walton, 2015; see Job, Dweck & Walton, 2010 for similar findings with adults). Together, these results suggest that, for U.S. children, over time, experiences with successful self-control may lend support to the developing belief that desires can be controlled, and this in turn may facilitate inhibition, delay of gratification, and potentially also persistence in working towards challenging future goals (Dweck, 2000).

In Singapore and China where interdependence is emphasized, children may experience and view self-control as externally caused, thus their self-control experience may *not* be related with free will beliefs about desires. However, we do see developmental changes in free will beliefs among Singaporean children and Chinese children during preschool and middle childhood (and Chinese even develop to a comparable level as U.S. children). This leaves open the question that how they develop these beliefs. We speculate that children in these cultures may develop their free will beliefs from exogenous sources, for example cultural values that are transmitted through parents, teachers or others in the culture etc. The finding that

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Singaporean children endorse weaker beliefs in free will than Chinese children suggests the influence of cultural values. As mentioned in introduction, Singaporean culture emphasizes hierarchy, rules and punishment more than Chinese culture (Connor, 1996; Chernyak et al., in press). Singaporean parents and teachers frequently talk about punishment and orders in their conversations with their children, which may lead their children to have weaker beliefs in free will than Chinese children (Chernyak et al., under review). These differences direct future research to examine how children's first-person experience and specific cultural influences (e.g. parenting practice) may jointly shape the development of free will beliefs.

Our research also adds to the body of research on investigating the influences that may facilitate or undermine self-control. Since self-control may be experienced differently across cultures, different influences may be effective for improving self-control across cultures. For example, for children in independent cultures (e.g. U.S.), influences that emphasize the role of internal states (e.g. intervening on free will beliefs about desires) may be helpful in facilitating self-control. However, for children in interdependent cultures, influences that emphasize the role of external forces (e.g.

social norms, expectations from others, etc) may be more helpful. Generally consistent with this idea, one recent study shows that different parenting practices are related to better delay-of-gratification performance in different cultures (Lamm et al., 2017). More experimental studies are needed to investigate the specific influences that can facilitate self-control in different cultures.

Our study suggests that a comprehensive understanding of development of self-control and free will beliefs requires a socio-cultural perspective. Future studies should further investigate how children's first-person self-control experience and cultural influences may jointly shape the development of free will beliefs, and how beliefs may further shape self-control development in each culture.

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## Supplementary Materials

### Results for Control Questions in Free Will tasks

We examined children's responses to the control questions. The majority of children in all three cultures (96.3% in the U.S., 86% in Singapore, 95.8% in China) judged that the story characters could choose to make simple unconstrained choices – e.g., drinking orange juice instead of milk (Binomial $p$'s < .001). On the other hand, the majority of children in all three cultures (92.6% in the U.S, 100% in Singapore, 94.4% in China) judged that the story characters could not choose to perform physically impossible actions even if they really wanted to – e.g., walk through a brick

wall, Binomial *p's* < .001. We also looked at children's responses to the norm ok questions and norm choice questions. For each question, a child would receive a score of 1 if he/she answered "yes" and a score of 0 if he/she answered "no". We averaged their score for the three okay questions, such that each child received a norm okay score (between 0 to 1). We also averaged their score for the three choice questions, such that each child also received a norm choice score (between 0 to 1). One sample t-tests show that, in all three cultures, children's norm okay score and norm choice score were below chance level (0.5), *p's* <. 001.

To investigate if these universal beliefs show developmental or cultural variation, we performed two binary logistic regression analyses (one for simple choice, one for physically impossible choice) on children's response to the Choice question with Culture, Age and Culture X Age interaction as predictors. None of these predictors were significant (all *p's* = n.s.). We also performed two linear regression analysis (one for norm okay score, one for norm choice score) on children's responses in the norm questions with Culture, Age and Culture X Age interaction as predictors. We only found a main effect of Age ($b$ = .08, 95% CI = [.02, .14], *t(170)* = 2.60, *p*

= .01) for the norm choice score. Across cultures, older children were more likely to say they can choose to act against moral or prudential norms. However, even for children older than 6 years old ($N = 95$), their endorsement of choice in norm questions are below chance in all three cultures, $t (94) = -4.46$, $p < .001$. Thus, although older children were more likely to endorse choice to act against norms than younger children, children across all ages in all three cultures share the intuition that people can choose to perform simple choices while recognizing that people cannot choose to perform physically impossible actions or morally impermissible actions.

**Analyses on Relationship Between Individual Self-control Tasks**

We also ran partial correlations among individual self-control tasks controlling for age in each culture. Table S2.1. shows the partial correlations. We see that tasks are correlated with each other (other than Day/Night Stroop) for U.S. children. However, for Singaporean children, Day/Night Stroop are strongly correlated with Hearts & Flowers and Toy Sort, but other tasks are less correlated. For Chinese children, the only significant partial correlation was between Day/Night Stroop and Hearts & Flowers. These results indicate that the self-control tasks were more

intercorrelated with each other in the U.S. than Singapore and China.

Table S2.1. Correlations among Individual Self-control task and Free Will task Controlling for Age.

| U.S. | Day/Night | Hearts & Flowers | Toy Sort | Gift Wrap |
|---|---|---|---|---|
| Day/Night Stroop | | .20 | .21 | .18 |
| Hearts and Flowers | | | .49*** | .37** |
| Toy Sort | | | | .29* |

| Singapore | Day/Night | Hearts & Flowers | Toy Sort | Gift Wrap |
|---|---|---|---|---|
| Day/Night Stroop | | .62** | .51** | .11 |
| Hearts and Flowers | | | .22 | .07 |
| Toy Sort | | | | .05 |

| China | Day/Night | Hearts & Flowers | Toy Sort | Gift Wrap |
|---|---|---|---|---|
| Day/Night Stroop | | .32** | -.027 | .01 |
| Hearts and Flowers | | | -.10 | .16 |
| Toy Sort | | | | .006 |

CHAPTER 3

She Helped Even Though She Wanted to Play: Children Consider Psychological Cost

in Social Evaluations

**Introduction**

Suppose that you ask two of your friends to help you with a paper you have to

finish tonight; at the same time there is a really good show on tv. One of your friends

really likes this show. The other friend does not have any interest in the show at all. If

each one of these friends offered to help you with your paper, would you evaluate

their actions towards you differently? Even if both friends ended up helping you, the

one who gave up watching her favorite show incurred a higher psychological cost to

do so, and intuitively this might lead us to appreciate her help more and perhaps even

evaluate her as nicer and kinder. The costliness of her choice to help seems to weigh

heavily in our evaluation. We investigate children and adults' intuitions about

psychological cost as it relates to moral status in the current studies.

The ability to make social evaluations about others develops early in childhood

(Hamlin, Wynn, & Bloom, 2007; Hamlin, Wynn, Bloom, & Mahajan, 2011; Burns &

Sommerville, 2014; Geraci & Surian, 2011; Sloane, Baillargeon, & Premack, 2012; Olson & Spelke, 2008). Even infants and young children prefer someone who helps another person fulfill a goal (e.g., climbing a mountain or opening a box) over someone who hinders another person from goal completion (e.g., Hamlin et al., 2007) and prefer someone who shares equally with others over someone who does not share equally (e.g., Olson & Spelke, 2008). This research has mainly focused on comparing actions that bring about different outcomes (usually a positive outcome vs. a negative outcome). By preschool age, children consistently consider the intention behind an action even when it is inconsistent with its outcome (e.g., attempted or innocent harm; see Baird & Astington, 2004; Cushman, Sheketoff, Wharton, & Carey, 2013; Killen, Mulvey, Richardson, Jampol, & Woodward, 2011). Prior work suggests a link between the development of intent-based social evaluation and theory of mind (Killen et al., 2011; Smetana et al., 2012).

Previous research has examined young children's consideration of costs in their inferences of individual's goals and preferences.   For example, infants consider the cost that someone expends to achieve a goal when making inferences on how

much the agent values the goal. After seeing someone achieve two goals one at a larger cost than the other (e.g. has to jump over a higher barrier), infants expect her to value the goal that incurs a larger cost more than the other goal (Liu, Ullman, Tenenbaum, & Spelke, 2017).    Similarly, toddlers are more likely to exonerate a non-helper for whom helping would have been hard than someone for whom helping would have been easy (Jara-Ettinger, Tenenbaum, & Schulz, 2015). Preschoolers even consider the cost they themselves incur to share with others in interpreting if their own actions are prosocial (Chernyak & Kushnir, 2013, 2018).

To date, studies of young children's evaluation of agents' psychological or moral status based on cost have focused on tangible goods - physical obstacles such as distance or barriers or valuable resources such as toys or stickers. Our initial example of the friend who gives up her favorite tv show is both like and unlike these cases. It is like resource sharing because the tv show can be thought of as having value, like stickers or toys. However, it is unlike resource sharing in that the value is intangible rather than tangible, a mental state rather than an object. Less is known about how children's understanding of this, more psychological, type of cost plays a role in their

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social evaluations.

Several pieces of evidence suggest that understanding psychological cost may be challenging for young children. First, one recent study (Starmans & Bloom, 2016) looked at children's evaluation of inner moral conflicts. In this study, children of 3 to 8 years old and adults were asked to compare two characters who both ultimately acted morally, but one acted morally without experiencing inner conflict, while the other resolved an inner conflict between a self-interested desire and a moral desire in order to act morally. Starmans & Bloom (2016) found that although adults evaluated the conflicted character more favorably than the unconflicted character, children of 3 to 8 years old showed the opposite evaluation. This result shows that children do not recognize the moral virtue of resolving inner conflicts until after age 8. However, it leaves open the question of whether the conflict itself was difficult for children to understand (having both a moral and selfish desire at once), or the psychological cost was difficult to understand (forgoing something one likes in order to act morally).

Second, much recent evidence has shown that during early and middle childhood children increasingly recognize the possibility and positivity of overcoming

immediate self-interested desires. For example, between 4 and 7, children increasingly believe that one can choose to act contrary to personal desires (e.g., Kushnir et al., 2015). Children also increasingly predict that individuals will act against personal desires (e.g. play) to comply with moral rules (e.g. help brother) and would feel good about it (Lagattuta, 2005; Lagattuta, Nucci, & Bosacki, 2010). Similarly, they also increasingly predict that an individual will act towards higher-order goals (e.g. doing homework) rather than succumbing to immediate desires (e.g. watching cartoons) (Yang & Fyre, 2018) Therefore, it is likely that, during early and middle childhood, as children view forgoing immediate self-interested desires to be possible and positive, they may increasingly favorably evaluate someone who endures high psychological cost to do the right thing.

In two studies, we investigated how information about psychological costs affects children's social evaluations. Our first research question was, at what age can children evaluate someone who incurs higher psychological costs to fulfill social or moral obligations as more virtuous? In Study 1, we asked children and adults to compare two characters who ultimately did the right thing, but one incurred a larger

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psychological cost (i.e., forewent something she really likes) in order to do the right thing, while the other incurred a smaller psychological cost (i.e., forwent something she does not like). We closely followed the procedure of Starmans & Bloom (2016) but, importantly, we removed expressions of inner conflict from the procedure by mentioning moral actions without stating moral desires. We focused on children of 4 to 9 years old. Our second research question was how children make inferences on the agents' moral desires based on the information on psychological costs incurred to perform the moral action. Thus, after asking children to make evaluations, we also asked children to make inferences about the unstated moral desires of each character. Our final question was whether children's social evaluations may differ by the types of costs. Thus, in Study 2, we tested how children's evaluation of incurring psychological cost compare to their understanding of incurring physical cost.

**Study 1**

**Method**

  **Participants.** One-hundred and twelve 4- to 9-year-olds (4.02- 9.95, $M$ = 6.86, $SD$ = 1.67, 52 boys) from Ithaca, New York were recruited for this study. Mirroring

the procedure in Starmans & Bloom (2016), we divided the children into three age groups: 4- to 5-year-olds, 6- to 7-year-olds, 8- to 9-year-olds. Specifically, 39 4- to 5-year-olds (4.02- 5.85, $M = 4.99$, $SD = .52$, 21 boys), 37 6- to 7-year-olds (6.00 - 7.98, $M = 6.94$, $SD = .64$, 17 boys) and 36 8- to 9-year-olds (8.00 – 9.95, $M = 8.80$ $SD = .60$, 14 boys) were included in the analyses. In addition, 92 adults were recruited from Amazon Mechanical Turk.

**Materials and Procedure.** Each child was read four pairs of stories and shown accompanying pictures adapted from Starmans & Bloom (2016) (see Figure 3.1 for an example). Each pair of stories described two characters who both performed a good action (e.g. helping her brother). One character (i.e., the "high psychological cost" character) incurred a higher psychological cost and forewent something she really liked in order to perform the good action. The other character (i.e., the "low psychological cost" character) incurred a lower psychological cost and forewent something she did not really like. Two story items (one Helping Story about helping siblings, one Honesty Story about telling truth to mom) were adapted from Starmans & Bloom (2017) and concerned moral obligations. We added two other pairs of stories

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about following rules (one Dishes Story about cleaning up dishes as mom asks, one

Toys Story about playing the toy mom asks to play).

"High Psychological Cost" Character:
This is Ana, and this is Ana's brother. Ana's brother lost his favorite ball. He has been looking for it really hard, but he still hasn't found it. So he asked Ana to help him look for it. Helping people is the right thing to do. Ana's friends are playing right outside. Ana likes playing outside. She wants to go play outside right now.
But Ana helped her brother look for his ball. It was really hard for Ana to help her brother because she wanted to play outside. But Ana helped her brother anyway.

"Low Psychological Cost" Character:
This is Tiffany, and this is Tiffany's brother. Tiffany's brother lost his favorite ball. He has been looking really hard, but he still hasn't found it. So he asked Tiffany to help him look for it.
Helping people is the right thing to do. Tiffany's friends are playing right outside. But Tiffany doesn't like playing outside. She doesn't want to go play outside right now.
So Tiffany helped her brother look for his ball. It was really easy for Tiffany to help her brother because she didn't want to play outside. So Tiffany helped her brother.
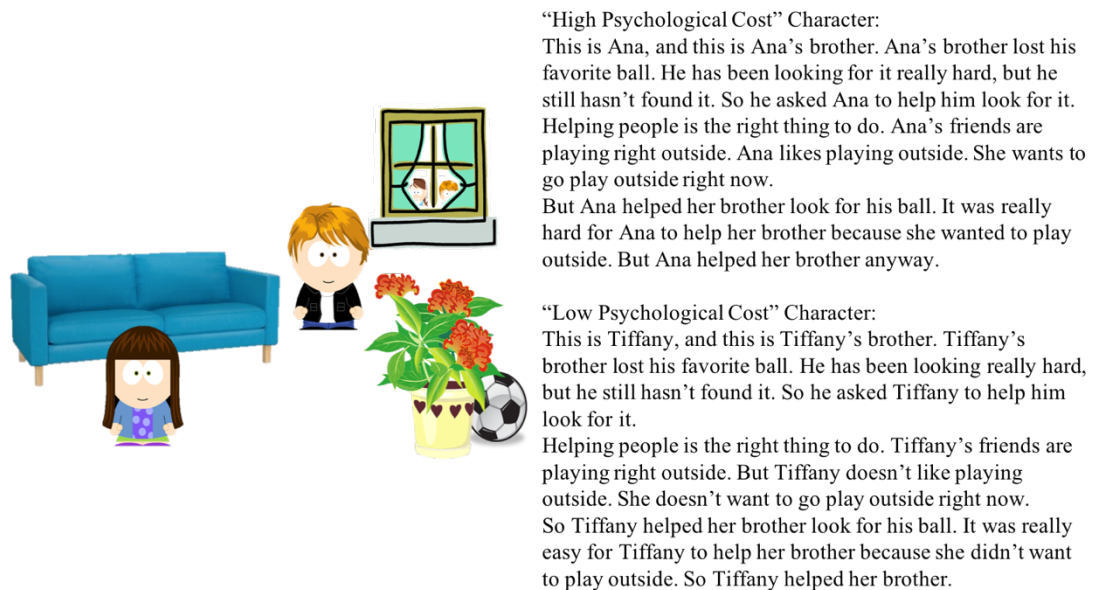
Figure 3.1 Example of the images and scripts presented in Study 1.

All the characters were the same gender as the participants. The order of

presenting the four stories was counterbalanced across participants. The order of

presenting the high psychological cost character and the low psychological cost

character was counterbalanced across story items for each participant. After hearing

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each pair of stories, the child was asked two remember check questions: "Who found it easy to do something good?" and "Who found it hard to do something good?" Children answered 95% of the trials correctly. We only included those trials where both remember check questions were answered correctly. Including those trials where the remember check questions were answered incorrectly did not change the pattern or significance of results reported here.

Following each story, we asked children two *social evaluation* questions. The first was (i.e., Prize question) "Which of the two characters would you give a prize to?" This was followed by a second question (i.e., Nicer question), "which one do you think is nicer?"

We then asked children a *moral desire rating* question for each character in each pair of stories: "How much do you think she (the "high cost" character) wants to do the right thing?" and "How much do you think she (the "low cost" character) wants to do the right thing?" For each question, children were asked to use a 3-point rating scale ("a lot", "a little bit", "not at all") to infer the degree of moral desire.

The adults received identical stimuli and questions, but read through these

materials themselves online, and the characters were not matched to adult participants' gender.

**Results**

      **Social Evaluation.** First, we examined our first research question that at what age can children evaluate someone who incurs higher psychological costs to fulfill social or moral obligations as more virtuous. See Figure 3.2 for results on children and adults' responses to the social evaluation questions. We conducted a binary logistic regression, with their responses ("low cost" character = 1, "high cost" character = 0) as the dependent variable and age group (4- to 5-year-olds, 6- to 7-year-olds, 8- to 9-year-olds, adults) as a between-subjects factor, and story item (helping, honesty, toys, dishes) and question (prize, nicer) as within-subjects factors. We found a significant main effect of age group (Wald $\chi^2$(3, $N$ = 208) = 83.29, $p$ < .001). Specifically, adults were more likely to favor the "high cost" character than either 6- to 7-year-olds (Wald $\chi^2$(1, $N$ = 129) = 19.18, $p$ <.001) or the 4- to 5-year-olds (Wald $\chi^2$(1, $N$ = 131) = 73.15, $p$ < .001). The 8- to 9-year-olds were not significantly different from the adults, $p$ = .64, but were more likely to choose "high cost" character than were either the 6- to

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7-year-olds (Wald $\chi^2$(1, $N$ = 73) = 8.91, $p$ = .003) or the 4- to 5-year-olds (Wald $\chi^2$(1,

$N$ =75) = 31.77, $p$ < .001). The 6- to 7-year-olds were also more likely to choose the

character who incurred a higher psychological cost than the 4- to 5-year-olds (Wald

$\chi^2$(1, $N$ = 76) = 7.09, $p$ = .008). We also found a main effect of item (Wald $\chi^2$(3, $N$ =

208) = 8.035, $p$ = .045), that children were more likely to favor the "high cost"

character in the Helping story and the Honesty story than the Dishes story (Helping vs.

Dishes: Wald $\chi^2$(1, $N$ = 208) = 4.31, $p$ = .038; Honesty vs. Dishes: Wald $\chi^2$(1, $N$ =

208) = 5.80, $p$ = .016). No significant differences were found among pairwise

comparisons between other story items. No effects of question type were found ($p$ =
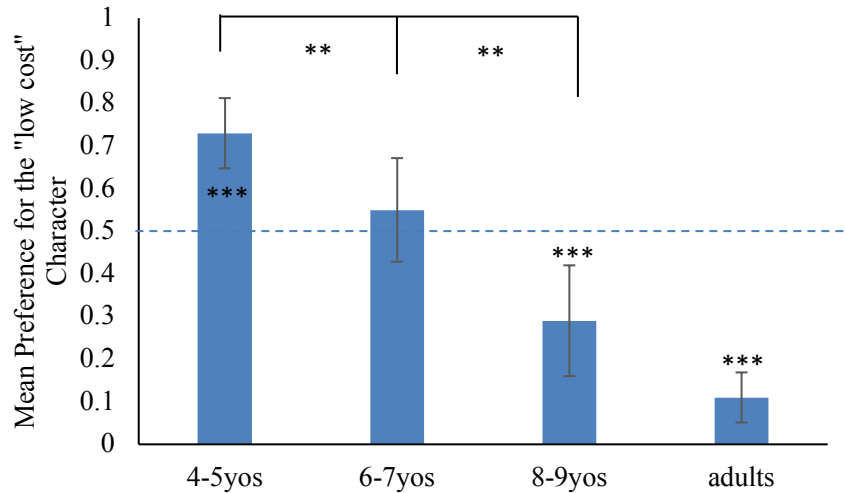
.60).

Figure 3.2 Children's and adults' mean preference for the "low cost" character in Study 1. Error bars represent 95% confidence intervals. Asterisks indicate significance of two-tailed t-tests. (**) $p < .01$, (***) $p < .001$.

To further explore the overall age effect, we then averaged participants' responses in two dependent measure questions across four story items and ran two-tailed one-sample t-tests to compare to chance (0.5) for each age group. Adults significantly favored the "high cost" character ($M = .25$), $t(91) = -6.87$, $p < .001$, 95% $CI = [-.32, -.17]$. In contrast, the 4-to 5-year-olds significantly favored the "low cost" character ($M = .73$), $t(38) = 5.43$, $d = $ , 95% $CI = [.14, .31]$. Responses of the 6- to 7-

year-olds did not differ from chance ($M = .55$), $t(36) = .83$, $p = .41$, 95% $CI = [-.07,$ .18]. The 8- to 9-year-olds significantly favored the "high cost" character ($M = .29$), $t(23) = .-3.49$, $p = .001$, 95% $CI = [-.33, -.08]$.

**Moral Desire Ratings.** Our second research question was how children make inferences on the agents' moral desires based on the psychological costs incurred to perform the moral action (see Figure 3.3). To investigate whether participants' ratings of moral desires are different for the two characters and whether the ratings vary by age, we ran an ordinal GEE with age group (4-to 5-year-olds, 6-to 7-year-olds, 8- to 9-year-olds, adults) as a between-subject factor, character ("low cost" character, "high cost" character) and story item as within-subject factors. We found a significant main effect of character (Wald $\chi2(1, N = 208) = 255.55$, $p < .001$) that participants rated higher moral desire for the "low cost" character than the "high cost" character. We also found a significant main effect of story item (Wald $\chi2(3, N = 208) = 48.09$, $p < .001$). Specifically, participants' ratings of moral desire were lower for the Dishes story than the three other stories ($p$'s $< .004$). No significant differences were found among pairwise comparisons between other stories. Interestingly, we found no

significant main effect of age group ($p = .09$) but found a significant interaction between age group and character (Wald $\chi2$(3, N = 208) = 25.92, $p < .001$). To further investigate the interaction between age group and character, for each age group, we ran an ordinal GEE with character ("low cost" character, "high cost" character) and story item as within-subject factors. We found that although participants in all age groups rated higher moral desire for the "low cost" character than the "high cost" character (4- to 5-year-olds: Wald $\chi2$(1, N = 39) = 31.93, $p < .001$; 6- to 7-year-olds: Wald $\chi2$(1, N = 37) = 73.61, $p < .001$; 8- to 9-year-olds: Wald $\chi2$(1, N = 24) = 61.90, $p < .001$; adults: Wald $\chi2$(1, N = 92) = 58.03, $p < .001$), but the difference was larger among children than adults (4- to 5-year-olds vs. adults: Wald $\chi2$(1, N = 131) = 6.30, $p = .012$; 6- to 7-year-olds vs. adults: Wald $\chi2$(1, N = 129) = 18.62, $p < .001$; 8- to 9-year-olds vs. adults: Wald $\chi2$(1, N = 130) = 15.19, $p < .001$).
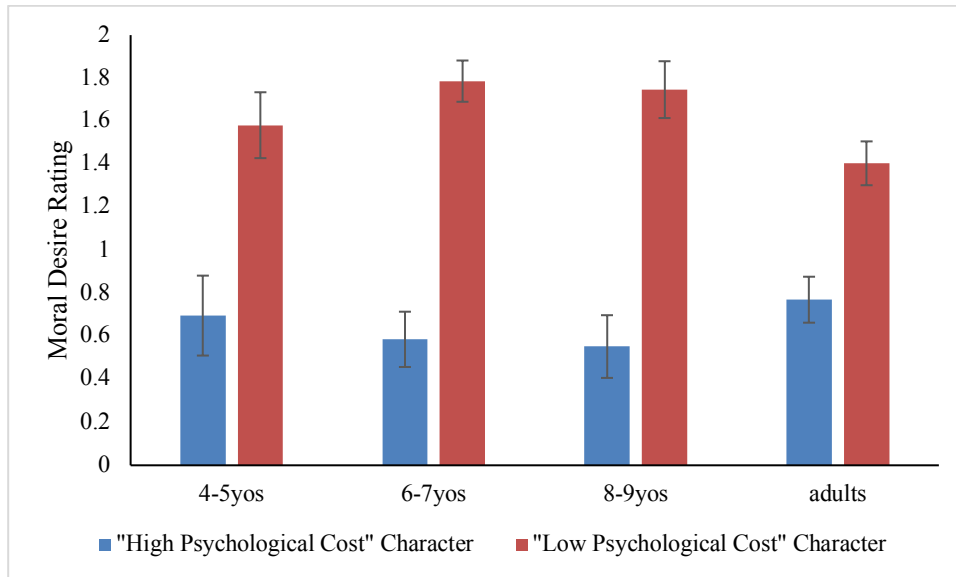
Figure 3.3 Mean moral desire ratings split by character and age group in Study 1. Error bars represent 95% confidence intervals.

**Relation Between Social Evaluation and Moral Desire Rating.** We also ran exploratory analyses to investigate the relation between participants' social evaluations of the two characters and their ratings of the characters' moral desires. We ran two correlation analyses for each group of participants (1. adults, 2. children controlling for age): one between participants' average social evaluations ("low cost" character = 1, "high cost" character = 0) and their average moral desire ratings for the

"low cost" character, and another similar correlation for the "high cost" character. We found a significant correlation between a more positive evaluation of "low cost" character and high moral desire ratings for the "low cost" character among both adults ($r = .29$, $p = .005$) and children (partial $r = .25$ controlling for age, $p = .008$). No significant correlations were found between evaluations and moral desire ratings for the "high cost" character (adults: $r = .09$, $p = .38$; children: partial $r = -.13$ controlling for age, $p = .19$).

**Discussion**

In Study 1, adults considered a person who incurred a higher psychological cost to do the right thing (e.g., help brother) more favorably than a person who incurred a lower psychological cost to do the same thing. We found a developmental change in this evaluation among children. Four- to five-year-olds showed completely opposite evaluation from adults. With age, children increasingly showed a preference for the character who incurred a higher psychological cost to help.

Our results help clarify age differences found in Starmans &Bloom (2016) in a few ways. First, in contrast to this prior study, when the difficulty was not explicitly

stated as having conflicting desires (a self-interested desire and a moral desire) at once, 8- to 9-year old children gave adult-like favorable evaluations of the character who overcame the difficulty to act morally. Moreover, 6- and 7-year-olds were at chance, rather than favoring the easy action. The reversal from the adult pattern only appeared in the youngest group.

Both children and adults inferred that the person who incurred a lower psychological cost had stronger desire to do the right thing than the person who incurs a higher psychological cost. This suggests that neither children nor adults intuitively inferred coexistence of two conflicting desires (e.g., a self-interested desire and a moral desire).

Although ideally a direct replication and comparison to Starmans & Bloom (2016) would be more informative, we speculate that our results so far may together rule out moral conflict as the central understanding driving children's and adults' social evaluations. Instead, our findings suggest the importance of developing understanding the virtue of incurring costs to do the right thing in children's evaluations. To further investigate this developmental change, in Study 2, we look at

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how children's consideration of psychological costs may compare to their consideration of physical costs in social evaluations. We focused on the youngest children from study 1, 4- to 7-year-olds, since we found that their evaluations were significantly different from adults. We tested a group of adults as a reference group.

## Study 2

**Method**

**Participants.** Seventy-two 4- to 7-year-olds (4.00- 7.99, $M = 5.92$, $SD = 1.17$, 32 boys) from Ithaca, NY were recruited for this study. We divided the children into a younger group (4- to 5-year-olds) and an older group (6- to 7-year-olds). Specifically, 37 4- to 5-year-olds (4.00- 5.95, $M = 4.89$, $SD = .58$, 21 boys), 35 6- to 7-year-olds (6.00 - 7.99, $M = 6.95$, $SD = .56$, 11 boys) were included in the analyses. In addition, 101 adults took part in this study and were included in the analyses.

**Materials and Procedure.** Participants were told four pairs of stories with accompanying pictures, each contrasting a "high cost" character (who incurred a high physical or psychological cost to do the right thing) with a "low cost" character (who incurred a low cost to do the right thing). Two pairs of the stories featured

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psychological costs and were the same as the Helping Story and the Dishes story in

Study 1. The other two pairs of stories featured physical cost (see Figure 3.4). For

example, in the Helping Story, the "high cost" character had to walk all the way up to

the top of the stairs to pick up the ball for her brother, while the "low cost" character

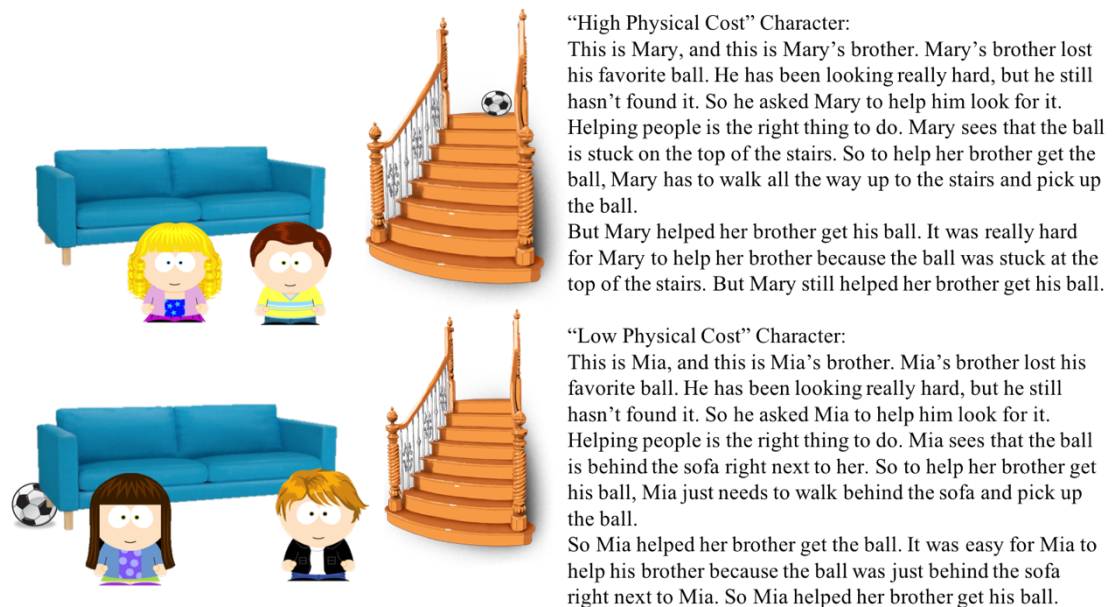just needed to walk behind the sofa next to her and picked up the ball.



"High Physical Cost" Character:
This is Mary, and this is Mary's brother. Mary's brother lost his favorite ball. He has been looking really hard, but he still hasn't found it. So he asked Mary to help him look for it. Helping people is the right thing to do. Mary sees that the ball is stuck on the top of the stairs. So to help her brother get the ball, Mary has to walk all the way up to the stairs and pick up the ball.
But Mary helped her brother get his ball. It was really hard for Mary to help her brother because the ball was stuck at the top of the stairs. But Mary still helped her brother get his ball.

"Low Physical Cost" Character:
This is Mia, and this is Mia's brother. Mia's brother lost his favorite ball. He has been looking really hard, but he still hasn't found it. So he asked Mia to help him look for it. Helping people is the right thing to do. Mia sees that the ball is behind the sofa right next to her. So to help her brother get his ball, Mia just needs to walk behind the sofa and pick up the ball.
So Mia helped her brother get the ball. It was easy for Mia to help his brother because the ball was just behind the sofa right next to Mia. So Mia helped her brother get his ball.

Figure 3.4 Example of the images and scripts featuring physical cost presented

in Study 2.

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All the characters were the same gender as the participants. The order of presenting the stories about psychological cost and stories about physical cost were counterbalanced across participants. The order of the high psychological cost character and the low psychological cost character were counterbalanced across stories for each participant. After hearing each pair of stories, the child was asked two remember check questions: "Who found it easy to do something good?" and "Who found it hard to do something good?" Children answered 93% of the trials correctly. We only included those trials where both remember check questions were answered correctly. Including those trials where the remember check questions were answered incorrectly did not change the pattern or significance of results reported here.

Following each story, children were asked the same two *social evaluation* questions (order counterbalanced) as in Study 1. One was (i.e., Prize question) "Which of the two characters would you give a prize to?" The other question (i.e., Nicer question) was "which one do you think is nicer?" We then asked children one *moral desire rating* question for each character using the same measures as Study 1.

The adults received identical stimuli and questions, but read through these

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materials themselves online, and the characters were not matched to adult participants' gender.

**Results**

   **Social Evaluations.** First, we examined participants' evaluation of the two characters (See Figure 3.5). We ran a binary logistic regression, with their responses ("low cost" character = 1, "high cost" character = 0) as the dependent variable and age group (4- to 5-year-olds, 6- to 7-year-olds, adults) as a between-subjects factor, and cost type (psychological, physical), story item (helping, dishes) and questions (prize, nicer) as within-subjects factors. We found a significant main effect of age group (Wald $\chi^2$(2, $N = 173$) = 89.93, $p < .001$). Specifically, adults were more likely to favor the "high cost" character than either the 6- to 7-year-olds (Wald $\chi^2$(1, $N = 136$) = 15.04, $p < .001$), or the 4- to 5-year-olds (Wald $\chi^2$(1, $N = 138$) = 89.76, $p < .001$). The 6- to 7-year-olds were also more likely to favor the "high cost" character than the 4- to 5-year-olds (Wald $\chi^2$(1, $N = 72$) = 20.53, $p < .001$). We also found a significant main effect of cost type (Wald $\chi^2$(1, $N = 173$) = 19.11, $p < .001$). Specifically, participants were more likely to favor the "high cost" character in the physical stories

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than in the psychological stories. No significant effects of question type or story item were found ($p$'s > .09).

To further investigate the overall age effects, we averaged participants' responses across two story items for each type of cost stories (Physical, Psychological). We then ran one-sample t-tests to compare participants' responses in each type of story to chance (0.5) for each age group. Adults significantly favored the "high cost" character in both physical stories ($M$ = .13, $t(94)$ = -13.27, $p$ < .001, 95% $CI$ = [-.43, -.32]) and psychological stories ($M$ = .20, $t(92)$ = -8.65, $p$ < .001, 95% $CI$ = [-.36, -.23]). In contrast, the 4-to 5-year-olds significantly favored the "low cost" character both for physical costs ($M$ = .64, $t(35)$ = 2.28, $p$ = .029, 95% $CI$ = [.02, .26]) and psychological costs ($M$ = .75, $t(36)$ = 5.16, $p$ < .001, 95% $CI$ = [.15, .35]). The 6-to 7-year-olds significantly favored the "high cost" character for the physical stories ($M$ = .30, $t(32)$ = - 3.46, $p$ = .002, 95% $CI$ = [-.32, -.08]) but their responses did not differ from chance for the psychological stories ($M$ = .47, $t(32)$ = -.40, $p$ =.69, 95% $CI$ = [-.18, .12]).
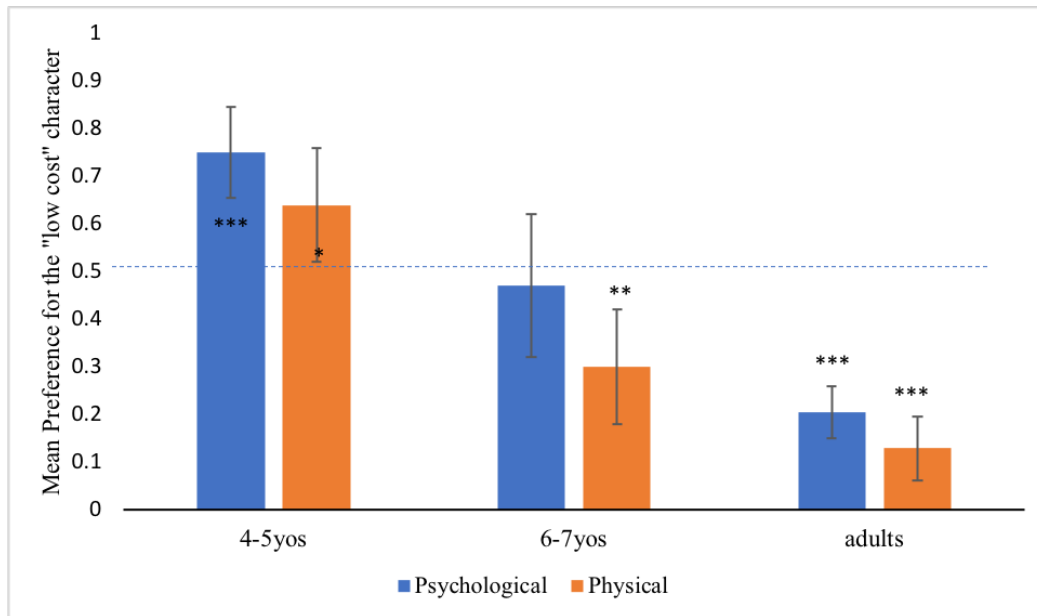
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Figure 3.5 Children's and adults' mean preference for the "low cost" character in Study 2. Error bars represent 95% confidence intervals. Asterisks indicate significance of two-tailed t-tests. (**) $p < .01$, (***) $p < .001$.

**Moral Desire Ratings.** We then examined participants' moral desire ratings for the characters. We ran an ordinal GEE with age group (4-to 5-year-olds, 6-to 7-year-olds, adults) as a between-subject factor and character ("low cost" character, "high cost" character), cost type (psychological, physical) and story item (Helping,

Dishes) as within-subject factors. We found a significant main effect of character (Wald $\chi^2$(1, $N$ = 163) = 91.98, $p$ < .001) that participants rated higher moral desire for the "low cost" character ($M$ = 1.39, $SD$ = .67) than the "high cost" character ($M$ = .95, $SD$ = .79). We also found a significant main effect of cost type (Wald $\chi^2$(1, $N$ = 163) = 5.69, $p$ =.017), that participants' moral desire ratings for the characters are higher in the physical stories ($M$ = 1.21, $SD$ = .76) than the psychological stories ($M$ = 1.12, $SD$ = .77). We also found a significant main effect of story item (Wald $\chi^2$(1, $N$ = 163) = 32.74, $p$ < .001), that the moral desire ratings for the characters are higher in the Helping stories ($M$ = 1.25, $SD$ = .74) than the Dishes stories ($M$ = 1.11, $SD$ = .77). We did not find a main effect of age group ($p$ = .51). Intriguingly, we also found a significant interaction between character and cost type (Wald $\chi^2$(1, $N$ = 163) = 31.67, $p$ < .001). Follow-up analyses showed that participants rated stronger moral desire for the "low cost" character than the "high cost" character for both psychological cost (Wald $\chi^2$(1, $N$ = 160) = 76.99, $p$ < .001) and physical cost (Wald $\chi^2$(1, $N$ = 160) = 13.98, $p$ < .001), but the difference is stronger for psychological cost than for physical cost. We also found a significant interaction between age group and character (Wald

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$\chi^2(2, N = 163) = 26.52, p < .001$).Participants in all age groups rated stronger moral desire for the "low cost" character than the "high cost" character (4- to 5-year-olds: Wald $\chi^2(1, N = 37) = 33.23, p < .001$; 6- to 7-year-olds: Wald $\chi^2(1, N = 33) = 40.04, p < .001$; Wald $\chi^2(1, N = 98) = 15.69, p < .001$), but the difference is stronger among children than adults (4- to 5-year-olds vs. adults: Wald $\chi^2(1, N = 138) = 17.07, p < .001$; 6-to 7-year-olds vs. adults: Wald $\chi^2(1, N = 136) = 15.11, p < .001$).
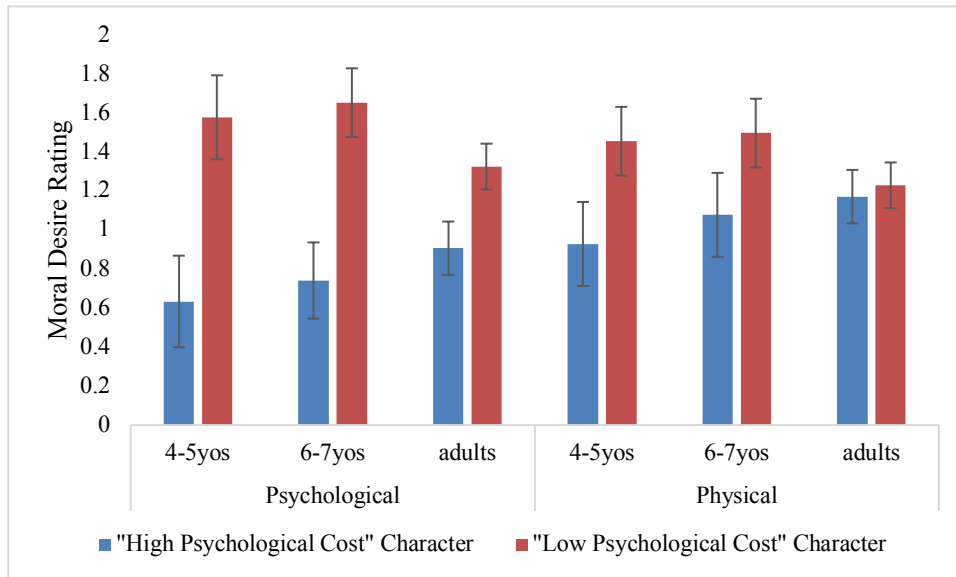


Figure 3.6 Mean moral desire ratings split by target, age group and cost type in

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Study 2. Error bars represent 95% confidence intervals.

**Relation Between Social Evaluation and Moral Desire Rating.** Similar as I Study 1, we also ran exploratory analyses to investigate the relation between participants' social evaluations of the two characters and their ratings of the characters' moral desires. For each cost type, we ran two correlation analyses for each group of participants (1. adults, 2. children controlling for age): one between participants' average social evaluations ("low cost" character = 1, "high cost" character = 0) and their average moral desire ratings for the "low cost" character, and another similar correlation for the "high cost" character. We found a correlation between a more positive evaluation of the "low cost" character and higher rating of moral desire for the "low cost" character for both adults ($r = .26$, $p = .011$) for psychological costs, and no significant correlation for physical costs ($p$'s > .076). No significant correlations were found among children ($p$'s > 35).

**Discussion**

In Study 2, we looked at how children's considerations of psychological costs compare to their considerations of physical costs in social evaluations. Adults

consistently demonstrated a favorable evaluation for someone who incurred a high psychological or physical cost to do the right thing. Preschool-age children (4- to 5-year-olds) demonstrated an opposite evaluation from adults, favoring the person who incurred a lower psychological cost or physical cost. Most six- and seven-year-olds recognize the virtue of acting at a physical cost. Some of them also recognize the virtue of acting at a psychological cost. These results further support the idea that children's evaluation of moral virtue depends on their understanding of cost rather than conflict: Physical cost is incorporated early in development, and psychological cost later.

## General Discussion

In this paper, we investigated children's consideration of costs in their social and moral evaluations. Prior studies have mostly focused on children's understanding of physical costs including physical obstacles or valuable resources. Across two studies, we show that young children may start out with an intuitive preference for individuals who find it easy to do something good, and that they gradually transition to an adult-like understanding that incurring costs to do something good is positive,

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praiseworthy and morally virtuous. Importantly, neither adults nor children inferred conflicting moral and personal desires spontaneously. This helps clear the findings in our study and findings in Starmans &Bloom (2016). It seems that children recognize the virtue of incurring costs before recognizing the virtue of resolving conflicting desires. Moreover, children's recognition of the positivity of incurring costs to do the right thing seems to develop in two stages: They first recognize the positivity of overcoming *physical* obstacles at around 6 to 7 years old, and then understanding the positivity of overcoming *psychological* obstacles at around 8 to 9 years old.

The difference we found between children's consideration of the psychological costs and physical costs add to prior work on children's understanding about costs. Understanding psychological costs is similar to understanding physical costs in that they both involve recognizing the possibility and positivity of making efforts and overcoming some kind of difficulty. However, they are also different in that understanding psychological costs rely on understanding that people may have different desires and that they need to make mental efforts to overcome the psychological obstacles, which may be part of higher-order theory-of-mind

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understanding (Lagattuta et al. 2015). Exploring interactions of understanding of costs and children's mental state understanding is an important direction for future work.

Our findings on inferences of moral desires complement prior work on children's inferences of goals and intentions. Our results showed that, when reasoning about psychological costs, both children and adults inferred that the person who incurred a lower psychological cost had stronger desire to do the right thing than the person who incurred a higher psychological cost even though both characters ended up doing the right thing. This suggests that people's inferences of moral desires are not only sensitive to the outcomes, but also sensitive to whether the agents had competing desires that may lead to a different outcome. For stories about physical costs, children still inferred that the character who had to incur a lower physical cost wanted to do the right thing more than the character who had to incur a higher physical cost. This result may seem counter-intuitive at first, however we speculate that it may reflect children's own desire to incur lower costs and live an easy life themselves. Also, it should be noted that the difference between their moral desire ratings for the two characters was smaller in the physical stories than in the psychological stories, which further supports

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the idea that children consider the existence of competing self-interested desires in their inferences of moral desire.

What underlies the development between ages 4 and 9? There are at least three possible explanations for this developmental change. First, it is possible that, as children age, they increasingly experience situations where they need to incur physical or psychological costs (for example, giving up something they really like) in order to achieve certain social or moral goals. Through such experience of they may gradually recognize the effort one needs to put in this process, and thus understand the virtue of incurring costs to do the right thing. Second, it is also possible that as children get older, they may be increasingly praised and encouraged for making efforts to overcome some physical or psychological difficulties to achieve certain goals by caregivers or teachers. The final possibility is that younger children may have a bias that someone who incurs a lower cost simply has higher competence, while only later they gradually understand that easiness is not necessarily the indicator for competence. This possibility is consistent with prior work in children's reasoning about ability showing that 4-year-olds judge someone who finds a task easy to be smarter than one

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who find the same task hard (Heyman, Gee, & Giles, 2003). These possibilities are certainly not mutually exclusive. It might be that children's first-person experience, the linguistic input they receive, and their increasingly mature understanding of competence together guide their development of an understanding of the virtue of incurring costs to do the right thing.

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CHAPTER 4

Leaving a Choice for Others: Children's Social Evaluations of Considerate Actions

**Introduction**

We live in a highly interdependent world, where many of our everyday actions

are carried out in shared environments. The actions we perform often have direct or

indirect consequences for others, from neighbors on the street to strangers at an airport.

In such shared environments, being considerate is often regarded as a virtue; we value

those who act with others in mind, maximizing potential benefits and minimizing

harm to others even when trying to achieve their own goals. The ability to recognize

and evaluate considerate actions is critical for successfully navigating the social world.

Even young children are highly tuned to others' kindness and hostility (Hamlin,

Wynn, & Bloom, 2007; Burns & Sommerville, 2014; Olson & Spelke, 2008). For

example, infants prefer someone who helped another person fulfill a goal (e.g.,

climbing a mountain) over someone who hindered another person from goal

completion (e.g., Hamlin et al., 2007). However, much of the previous research has

focused on how children evaluate *other-oriented* actions. Such actions usually involve

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direct, purposeful transfer of physical force, resources, or information from the actor to the recipient (Tomasello, 2009) and have clear consequences for the recipient.

Yet, evaluating the considerateness of others' actions when those actions are primarily *self-serving* (i.e., intended to fulfill one's own needs) may be more complex. Suppose Jenny stands in line for a dessert with just one more person waiting behind her. When it is Jenny's turn to choose, there are only three items left on the dessert table: two fruit tarts and one chocolate mousse. Jenny's decision to take one of the two fruit tarts versus the only chocolate mousse will either grant or deprive the last person from an opportunity to choose between two varieties. Thus, even though Jenny's action is primarily driven by a self-serving intention of getting a dessert for herself, it nevertheless has a foreseeable effect on someone else. If Jenny knows that the last person prefers fruit tarts over chocolate mousses, she could take the only chocolate mousse. But what if Jenny has no information about the next person's preference? In that case, taking one of the fruit tarts and leaving a choice seems to be more considerate.

Recent work provides indirect evidence that this intuition is widely shared

among adults. When people are selecting products for themselves, they often, considerately, leave a choice for another person (Van Doesum, Van Lange, & Van Lange, 2013). Moreover, adults judge someone who leaves a choice for others more favorably than someone who does nots (Van Doesum et al., 2013, Study 2). However, understanding the considerateness of an action can be particularly challenging for young children; there is no explicit information about the prosocial intention of the actor nor the immediate outcome for the recipient, and both must be inferred from the context. Prior work suggests that it is not until late preschool years that children consistently consider the intention behind an action in addition to the outcome (e.g., attempted or innocent harm; see Cushman, Sheketoff, Wharton, & Carey, 2013).

Successfully evaluating the considerateness of leaving a choice requires an abstract understanding of the value of variety in options (Leotti, Iyengar, & Ochsner, 2010; Schwartz, 2004). Adults prefer to have a diverse set of options to choose from rather than a limited set of options (Deci & Ryan, 2012; Leotti et al., 2010). Even children as young as 4 understand that people prefer possessing two different items to possessing two identical items (Echelbarger & Gelman, 2017). Therefore, it is possible

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that late preschool-aged children will appreciate someone who leaves a set of diverse options for others.

However, a genuine understanding of the value of considerate actions requires more than a sheer preference for diverse options; rather, it requires an understanding that the actions are motivated by *social intentions*. Inferring that an action is intentional, and not random or incidental, critically depends on the presence of available alternative actions. Suppose that Jenny sees either three different varieties of desserts or three identical desserts left on the table. In the first scenario, any action she performs will always leave two varieties. In the second scenario, no action she performs will do so. Either way, the choice or lack thereof is likely an incidental product of the situation rather than her social intention. Thus, Jenny's action is uninformative with respect to whether she had the intention to be considerate. Young children make inferences about others' actions and evaluate others' helpfulness in light of available alternative actions (Gergely, Bekkering, & Kiraly, 2002; Kushnir et al., 2010; Kushnir, 2018; Gweon & Asaba, 2018; Chernyak & Kushnir, 2013; 2018). Importantly, inferring the social intention behind an action also depends on the

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presence of a beneficiary. If nobody was waiting behind Jenny, we would infer that her action does not involve a social intention. If children do have an abstract understanding of considerate actions, they should favor agents who leave a choice for others specifically when their actions convey a clear intent to benefit another person given the social context.

Here we ask whether children can positively evaluate an agent who leaves a choice for others over an agent who limits a choice for others (Study 1), and do so selectively when the actions signal a social intention – but not when alternative actions are *not* available to the agents (Study 2) nor in the absence of a beneficiary (Study 3). Given a relatively late development of intention-based social evaluations among preschoolers (e.g., Cushman et al., 2013), we tested children between ages 4 and 6. We also tested a group of adults and used their evaluations as a frame of reference for interpreting developmental data.

We recruited our participants from two cultures: the US and China. One might wonder whether children's ability to evaluate considerate actions reflects cultural learning of the particular values of children's social environment, rather than a

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manifestation of early-emerging social-cognitive capacities to make inferences about others' intentions and evaluate social consequences. Given that the two cultures differ in the relative importance placed on individuality vs. interdependence and the prevalence of explicit norms about being considerate (Markus & Kitayama, 1991), we explore whether the ability to recognize considerateness emerges despite potential differences in cultural values.

<center>**Study 1**</center>

**Method**

      **Participants.** Informed by developmental studies on comparable topics (e.g., Van de Vondervoort & Hamlin, 2017; Olson & Spelke, 2008) we set our sample size at 24 for each age group. Seventy-two 4-, 5-, and 6-year-olds from the U.S. (4.01 – 6.98 years old, $M = 5.51$, $SD = .85$; 24 per age group, 58% girls) and 72 4-, 5-, and 6-year-olds from China (4.13 – 6.96 years old, $M = 5.45$, $SD = .74$; 24 per age group, 53% girls) were included in our final analyses. U.S. participants were recruited from preschools, afterschool programs, and museums in a small university town. Chinese participants were recruited from preschools and after-school programs in Beijing,

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China. Children from both samples predominantly come from middle- to high-SES background. Eight additional children participated but were replaced because of a missing recording file (N = 1 in the U.S., N = 3 in China), because they voluntarily quit the study (N = 3 in China), or because they provided incorrect answers on the attention check questions (N = 1 in China, see below). Parents of all the children provided consent for their children to participate.

For the adult comparison groups, we conducted a priori power analysis (an effect size of $w = 0.5$ based on pilot test results, an alpha level of 0.05, a power of 0.80) and set our sample size as 32 per culture. Thus, 34 U.S. residents (*M* age = 32.32, *SD* age = 9.64; 62% male, 38% female) were recruited online through Amazon Mechanical Turk and 37 (*M* age = 28.75, *SD* age = 11.28; 35% male, 59% female, 6% other or unreported) Chinese residents were recruited online through social media. All the adults provided consent for their participation. The procedures and the analysis plan for the adult study were pre-registered on AsPredicted.

**Materials.** Child participants were shown three dolls and two boxes with plastic fruits (i.e., apples and bananas). Adult participants were presented with cartoon

illustrations of the same scenarios, and the characters all possess minimalistic facial features (i.e., only eyes).

The English protocol for preschoolers was first translated into Mandarin Chinese by a native Mandarin speaker, and back-translated into English by another Mandarin-English bilingual speaker. A native English speaker then compared the back translation with the original English protocol to check for accuracy and revised discrepancies through group discussions. The task instructions for adult participants were then developed to closely resemble the English protocol for children. Three different native Mandarin speakers then translated the instructions into Chinese and resolved discrepancies in their translations.

**Procedure.** All child participants were tested individually in a quiet room in local museums, preschools, or elementary schools. Children in the U.S. were tested in English by a U.S. experimenter, while children in China were tested in Mandarin by a Chinese experimenter.

The experimenter presented children with two scenarios in which Sophie waited in line for a snack. In each scenario, she was behind one of her friends (Bella or

Jenny). Each agent was allowed to choose one snack, and when it was her friend's turn

to choose, the options consisted of two identical fruits (e.g., two apples) and one

unique fruit (e.g., a banana). One friend chose one of two identical fruits (e.g., one

apple among two apples and one banana), leaving Sophie with a choice between two

different kinds of fruits (i.e., an apple and a banana). The other friend chose the unique

fruit (e.g., the apple among one apple and two bananas), leaving Sophie with two

fruits of one kind (e.g., two bananas). See Figure 4.1 for an example of the story setup.

The friend (Bella or Jenny) in each scenario and the type of choice left by the friends

were counterbalanced across participants. The full protocol can be accessed at

https://osf.io/y4vx3/?view_only=8e939b212b3f469a940056e945b28515.

      After being presented with both scenarios, the experimenter asked four

attention check questions to ensure that children had paid attention to and understood

the story. The questions were about what fruit each friend chose (i.e., "What did

Bella/Jenny choose?") and which fruits each friend left for Sophie (i.e., "What did

Bella/Jenny leave for Sophie to choose from?"). If the children answered any of the

four questions incorrectly, the experimenter would repeat the story and then ask the

same question again. If they answered incorrectly a second time, their data were

excluded from analyses (N = 1 in China). After that, the experimenter asked the main

question: "Who do you think is a nicer friend to Sophie?" After they provided an

answer, the experimenter asked "Why?" to prompt an explanation[3].

Adult participants read identical scenarios on Qualtrics and answered identical

social judgment questions except that they were not asked the attention check

questions before the dependent measures and were not requested to explain their

forced-choice responses. The full protocol can be accessed at

https://osf.io/y4vx3/?view_only=8e939b212b3f469a940056e945b28515.

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[3] After the main question, the experimenter also asked: "If you are going to

choose one from Bella and Jenny to play with, *who would you prefer to play with*?"

We included this question as an exploratory measure to examine whether children's

social affiliation preference is influenced by their social evaluation. Given the

potential influence of repeated questioning (Gonzalez, Shafto, Bonawtiz, & Gopnik,
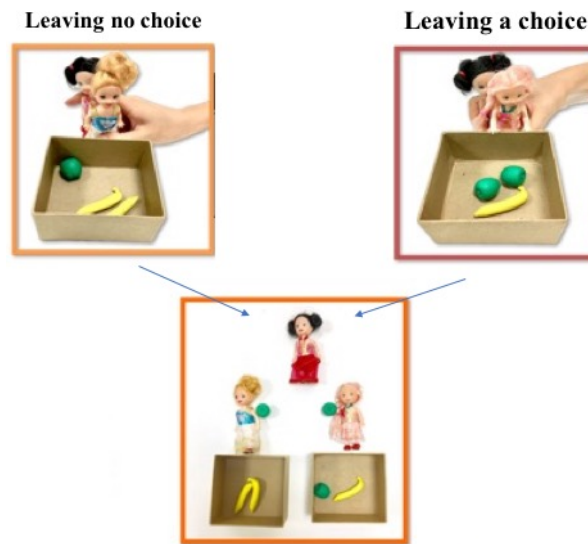
2012), we report the results in Supplementary Materials.

Figure 4.1 Examples of the story setup of Study 1. Children heard about Sophie (the character in red) waiting in a "snack line" twice to choose a fruit, each time behind one of her friends, Bella or Jenny. Each friend chose one fruit out of three fruits. One friend took an apple from one apple and two bananas, leaving Sophie with two bananas; the other friend took an apple from two apples and one banana, leaving Sophie with an apple and a banana.

**Coding**. Children's explanatory responses were coded as either referring to the

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concept of "leaving a choice for others" or not. For example, if a child mentioned "She left a choice" or "She left an apple and a banana" or "She left two kinds of fruit" in his/her explanation, then the explanation was coded as referring to the concept of "leaving choice for others." The first author coded all of the explanations in both cultures. Two research assistants blind to the conditions (one native English speaker and one native Mandarin speaker) each coded the explanations provided by U.S. children and Chinese children. The inter-coder reliabilities between the primary coder and the secondary coders were 97.2% (for U.S. children) and 98.6% (for Chinese children).

**Results**

First, we examined whether participants chose the friend who left a choice for Sophie as the "nicer" friend. We first looked at adults' responses. As expected, adults showed a robust tendency to choose the friend who left a choice for Sophie as nicer among both U.S. (97%, Binomial sign test, $p < .001$, $g = .47$, 95% CI = [84%,100%]) and Chinese adults (92%, Binomial sign test, $p < .001$, $g = .42$, 95% CI = [78%, 98%]).

We then examined children's responses using a binary logistic regression, with

friend choice as the dependent variable and age (continuous), gender, culture and presentation order as predictors. We found a significant effect of age (Wald $\chi^2$(1, $N =$ 144) = 7.68, $p$ = .006) but not culture ($p$ = .90); no other effects were significant ($p$'s > .51). Given the overall effect of age, we then examined children's responses separately in each age group. See Figure 4.2 for results. Four-year-olds' and five-year-olds' responses in both cultures were not significantly different from chance (two-tailed binomial sign tests, $p$'s > .064). By contrast, a significant majority of 6-year-olds in both cultures selected the friend who left a choice (U.S.: 79%, two-tailed binomial sign test, $p$ = .007, $g$ = .29, 95% CI = [58%, 93%]; China: 83%, two-tailed binomial test, $p$ = .002, $g$ = .33, 95% CI = [63%, 95%]). Thus, by age 6, both U.S. children and Chinese children judged the friend who left a choice to be nicer than the friend who left no choice.
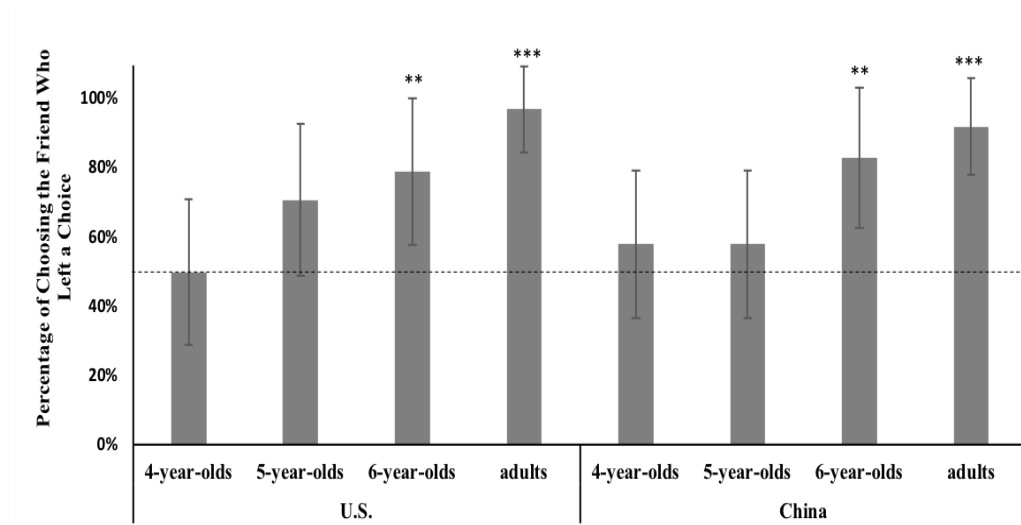
Figure 4.2 Percentages of participants choosing the friend who left a choice split by age group in the U.S. and China in Study 1. Error bars represent 95% confidence intervals. Asterisks represent significance of Binomial Sign tests. **: $p$ < .01, ***: $p$ < .001.

Children's qualitative explanations also showed similar developmental patterns (see Table 4.1 for the percentage of explanations that refer to the concept of "leaving a choice for others" in each culture). We conducted a binary logistic regression with

children's explanations as dependent variable and age (continuous), gender, culture and presentation order as predictors. The results revealed a significant effect of age (Wald $\chi^2$(1, $N = 144$) = 18.62, $p < .001$). We also found a significant main effect of culture ($\chi^2$(1, N= 144) = 9.82, $p = .002$), with Chinese children providing more explanations referring to "leaving a choice for others" than U.S. children.    Follow-up exploratory analyses showed that this cultural difference was mostly driven by 6-year-olds (U.S. vs. China: 38% vs. 75%, $\chi^2$(1) = 8.57, $p = .003$). Neither gender nor presentation order had significant main effects ($p's > .20$).

Table 4.1 Percentages of children's explanations that referred to the concept of "leaving choice for others" when asked who was a nicer friend in Study 1.

|  | 4-year-olds | 5-year-olds | 6-year-olds |
| --- | --- | --- | --- |
| U.S. | 8.3% | 25% | 37.5% |
| China | 25.0% | 33% | 79.2% |

**Study 2**

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In Study 1, we found that by age 6, children in both cultures evaluate someone who leaves a choice for another person as "nicer" than someone who does not. In Study 2, we investigated whether children's evaluations are based on a mere preference for variety or are based on genuine inferences about the agents' social intentions. We designed two between-subject conditions, each of which contrasted two friends who left identical outcomes for Sophie. In the Positive/Neutral condition, the Positive friend *could have left* a less diverse set of options while the Neutral friend had no alternative actions. In the Negative/Neutral condition, the Negative friend *could have left* a more diverse set of options while the Neutral friend had no alternative actions. If children's evaluations in Study 1 simply reflect a preference for variety, their evaluations would be at chance. However, if the results reflect genuine inferences about the agents' social intentions, they should evaluate the agent that had the alternative action to be nicer (or less nice) than the agent who had no alternative action.

**Method**

**Participants.** Given that the final outcomes were identical between the two agents, we expected a somewhat smaller effect size than Study 1. Thus, we set our

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sample size as 30 per condition per each age group. One hundred and eighty 4-, 5-, and 6-year-olds from the U.S. (Positive/Neutral condition: 4.08 – 6.97 years old, $M =$ 5.41, $SD = .88$; 30 per age group, 51% girls; Negative/Neutral condition: 3.97 – 6.98 years old, $M = 5.50$, $SD = .92$; 30 per age group, 47% girls) and 180 4-, 5-, and 6-year-olds from the China (Positive/Neutral condition: 4.02 – 6.93 years old, $M = 5.46$, $SD = .93$; 30 per age group, 55% girls; Negative/Neutral condition: 3.98 – 6.98 years old, $M = 5.49$, $SD = .91$; 30 per age group, 51% girls) were included in our final analyses. Fourteen additional children participated but were replaced because of experimenter error (N = 4 in China), missing audio files (N = 2 in the U.S., N = 5 in China), missing date of birth (N = 1 in China), or duplicated testing (N = 2 in the U.S.). Parents of all the children provided consent for their children to participate.

Sixty-seven U.S. adults ($M$ age = 34.60, $SD$ age = 9.57; 55% male, 45% female) and 84 Chinese adults ($M$ age = 30.02, $SD$ age = 11.67; 42% male, 58% female) were recruited online through Amazon Mechanical Turk and social media. All the adults provided consent for their participation. The procedures and the analysis plan for the adult study were pre-registered on AsPredicted.

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**Materials and procedure.** Participants were randomly assigned to one of two between-subjects conditions (the Positive/Neutral condition and the Negative/Neutral condition). The procedures were similar to those in Study 1 except for the comparisons participants made: In the Positive/Neutral condition, children were asked to compare a friend who takes an apple from two apples and one banana (the Positive Friend) with a friend who takes an orange from one orange, one banana, and one apple (the Neutral Friend). In the Negative/Neutral condition, children were asked to compare a friend who takes an apple from one apple and two bananas (the Negative Friend) with a friend who takes a banana from three bananas (the Neutral Friend). See Figure 4.3 for examples of the setup.
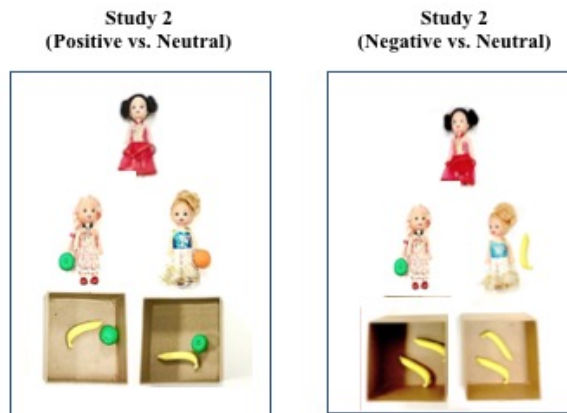
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Figure 4.3 Examples of the story setup of Study 2. In the Positive/Neutral condition, both friends left Sophie with one apple and one banana, but one friend took an apple from two apples and one banana (the Positive friend), while the other friend took an orange out of one apple, one banana, and one orange (the Neutral friend). In the Negative/Neutral condition, both friends left two bananas, but one friend took an apple from one apple and two bananas (the Negative friend), while the other friend simply took one of the three bananas (the Neutral friend).

**Coding.** We coded for explanations that referred to the available options the friend had (e.g. "She picked an apple. She knows there are two apples.") or the fruits

the friend left (e.g. "She left one apple and one banana.") as appealing to reasons related to considerateness. The first author coded all the explanations in both cultures. Two research assistants (a native English speaker and a native Mandarin speaker) each coded the explanations provided by U.S. children and Chinese children. The inter-coder reliabilities between the primary coder and the two other coders were 97.5% (for U.S. children) and 98.1% (for Chinese children).

**Results**

**The Positive/Neutral condition.** Figure 4.4 shows the percentages of participants who chose the Positive friend (i.e., the friend who took an apple from two apples and one banana) over the Neutral friend when asked "who is a nicer friend" split by age group in each culture. Adults' responses revealed a robust tendency to choose the Positive friend as nicer among both the U.S. (88%, Binomial sign test, $p < .001$, $g = .38$, 95% CI = [73%, 96%]) and Chinese adults (92%, Binomial sign test, $p < .001$, $g = .42$, 95% CI = [80%, 97%]).

We then examined children's responses using a binary logistic regression, with friend choice as the dependent variable and age (continuous), gender, culture and

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presentation order as predictors. We only found a significant positive effect of age

(Wald $\chi^2$(1, $N = 179$) = 10.99, $p$ = .001) and no other significant effects ($p$'s > .47),

including culture ($p$ = .47). Given the overall effect of age, we then examined

children's choice separately in each age group and culture. Similar to the results in

Study 1, four-year-olds' and 5-year-olds' responses in both cultures were not

significantly different from chance (two-tailed binomial sign tests, $p$'s > .36). By

contrast, a significant majority of 6-year-olds in both cultures selected the Positive

friend above chance (U.S. :70%, two-tailed binomial sign test, $p$ = .043, $g$ = .20, 95%

CI = [51%, 85%], China: 73%, two-tailed binomial sign test, $p$ = .016, $g$ = .23, 95%

CI = [54%, 88%]).

Children's qualitative explanations also showed similar developmental change

(See Table 4.2 for the percentages of children providing explanations that appeal to an

understanding of considerateness. We ran a binary logistic regression with children's

explanations as dependent variable and age (continuous), gender, culture and

presentation order as predictors. We found a significant positive effect of age (Wald

$\chi^2$(1, $N = 179$) = 17.51, $p$ < .001). We did not find any other main effects (all
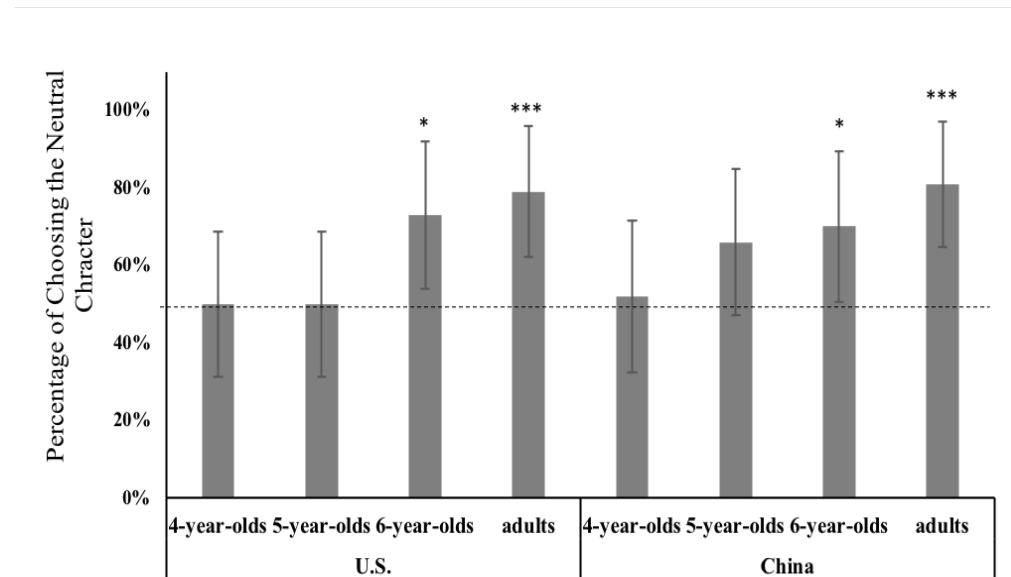
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Figure 4.4 Percentages of participants choosing the Positive friend in the Positive/Neutral condition in Study 2, split by age group and culture. Error bars represent 95% CI. Asterisks represent significance of Binomial Sign tests. **: *p* < .01, ***: *p* < .001.

Table 4.2 Percentages of children's explanations that referred to the understanding of considerateness in each condition of Study 2.

|                      |       | 4-year-olds | 5-year-olds | 6-year-olds |
|----------------------|-------|-------------|-------------|-------------|
| Positive/Neutral     | U.S.  | 0%          | 13.3%       | 23.3%       |
|                      | China | 6.7%        | 0%          | 36.7%       |
| Negative/Neutral     | U.S.  | 10%         | 10%         | 43.3%       |
|                      | China | 13.3%       | 16.7%       | 40%         |

**The Negative/Neutral condition.** Figure 4.5 shows the percentages of participants who chose the Neutral friend (i.e., the friend who took a banana from three bananas) over the Negative friend when asked "who is a nicer friend" in each age group split by culture. Adults' responses showed a robust tendency to choose the Neutral friend among both U.S. (79%, Binomial sign test, $p < .001$, Cohen's $g = .29$, 95% CI = [63%, 90%]) and Chinese adults (81%, Binomial sign test, $p < .001$, Cohen's $g = .31$, 95% CI = [65%, 91%]).

We then examined children's responses using a binary logistic regression, with friend choice as the dependent variable and age (continuous), gender, culture and presentation order as predictors. We only found a significant positive effect of age

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(Wald $\chi^2$(1, $N = 176$) = 6.67, $p$ = .010). We found no other significant effects ($p$'s > .28), including culture ($p$ = .51). Given the overall effect of age, we then examined children's responses separately in each age group and culture. Four-year-olds' and 5-year-olds' responses in both cultures were not significantly different from chance (two-tailed binomial sign test, $p$'s > .37). Importantly, a significant majority of 6-year-olds in both cultures selected the Neutral friend above chance (U.S.: 73%, two-tailed binomial sign test, $p$ = .016, $g$ = .23, 95% CI = [54%, 88%]; China: 70%, two-tailed binomial sign test, $p$ = .043, $g$ = .20, 95% CI = [51%, 85%]).

Children's qualitative explanations also showed similar developmental patterns (See Table 4.2 for the percentages of children providing explanations that appeal to an understanding of considerateness). We ran a binary logistic regression with children's explanations as the dependent variable and age (continuous), gender, culture and presentation order as predictors. We found a significant positive effect of age (Wald $\chi^2$(1, $N = 180$) = 18.82, $p < .001$). No other effect was significant ($p$'s > .38); including culture ($p$ = .67).
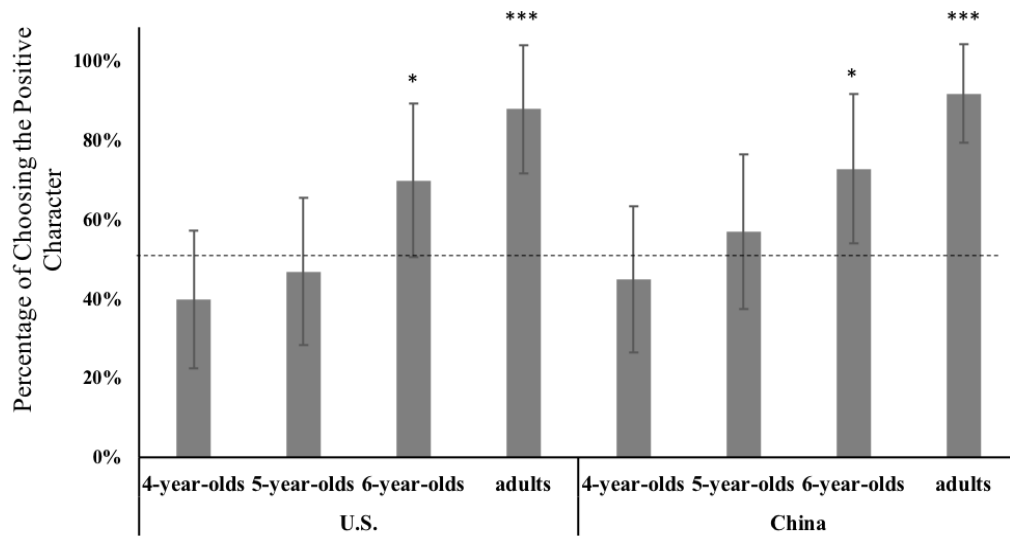
Figure 4.5 Percentages of participants choosing the Neutral character in

Negative/Neutral condition split by age group and condition in the U.S. and China.

Error bars represent 95% CI. Asterisks represent significance of Binomial Sign tests.

**: $p < .01$, ***: $p < .001$.

## Study 3

In Study 2, we found that by age 6, children in both cultures considered

whether there was an alternative action available to the agent who left (or did not leave)

a choice, suggesting that children do not simply prefer variety but rather account for

the social intentions of the actor in their evaluations. In Study 3, we investigated whether children consider the social nature of the action. We used scenarios identical to those in study 1 except for one critical difference: The protagonist was the last in line, and no beneficiary was behind her.

**Method**

**Participants.** Since 4-year-olds in both cultures did not make differentiated evaluations between the two protagonists in Study 1, we focused on only 5- and 6-year-olds. We determined our sample size of 30 children per age group per culture based on an *a priori* power analysis using the effect size of U.S. 5- and 6-year-olds in Study 1 ($g = .25$). Thirty-two U.S. children (5.10 – 6.92 years old, $M = 5.90$, $SD = .59$, 14 girls) and 30 Chinese children (5.10 – 6.99 years old, $M = 6.10$, $SD = .61$, 19 girls) were included in the final analyses. Nine additional children participated but were replaced because of experimenter error ($N = 4$ in the U.S., $N = 2$ in China), lost audio files ($N = 1$ in the U.S.), or duplicated testing ($N = 2$ in the U.S.). Parents of all the children provided consent for their children to participate. The procedures and the analysis plan for this study were pre-registered on AsPredicted.

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Materials and Procedure. The procedure was similar to Study 1, except that each scenario featured only one character (either Bella or Jenny), and there was nobody (i.e., Sophie) waiting behind that character. Children were presented with two scenarios in which one character took an apple from two apples and one banana, while the other character took an apple from one apple and two bananas. The critical dependent measure was "Who is a nicer friend?"

**Results**

We first examined their responses to "Who is a nicer friend". We conducted binomial tests to compare children's choice to chance level. In both cultures, around half of children chose the character that left a choice (U.S.: 50%, China: 48%, two-tailed binomial sign tests, $p's$ = 1.00). We also ran Chi-square tests to compare the responses of children in the current study and those from 5- and 6-year-olds in Study 1. In both cultures, children were more likely to favor the friend who left a choice when there was someone waiting behind them (Study 1) than when there was nobody waiting behind them (Study 3); U.S.: $\chi^2(1, N = 80) = 5.28$, $p = .022$; China: $\chi^2(1, N = 75) = 3.80$, $p = .051$.

We then examined their qualitative explanations and found that very few children (U.S.: 6.3%, China: 0%) provided explanations with reference to the concept of "leaving a choice for others." Further, children were also more likely to provide explanations that refer to "leaving a choice for others" in Study 1 than in Study 3 (U.S.: $\chi^2(1, N = 80) = 7.17, p = .007$; China: $\chi^2(1, N = 78) = 25.81, p < .001$). These results suggest that the presence of a beneficiary is necessary for children in both cultures to evaluate the character wo left a choice as nicer; when the self-serving action incurred no foreseeable effects on other people, children did not show any systematic preference for any character.

## General Discussion

Collectively, our results show that by age 6, children in both the U.S. and China recognize the considerateness of actions that leave a choice for others. In Study 1, children judged someone who left a choice for others as "nicer" than someone who left no choice. Critically, children's evaluations reflect more than a simple preference for variety; rather, they reveal an understanding of both the intention behind the act and the social nature of the action. In Study 2, children judged a person who left a

choice (or limited choice) for others to be nice (or mean) only when there were alternative actions available. In Study 3, children did not judge the agent as "nicer" when there was no beneficiary of the action.

We observed similar developmental trajectories among children in the U.S. and children in China. These data tentatively suggest that the ability to make these evaluations emerges from representational and inferential capacities that are basic to human social cognition. This is in line with prior findings that children's ability to reason about others' beliefs shows similar progression across cultures (with smaller variations in exact age and ordering of questions, see Liu Wellman, Tardif, & Sabbagh, 2008).

Although results from the U.S. and China were largely similar, we observed some cultural differences in Study 1: 6-year-olds in China were more likely to articulate the reason for their evaluation. One possibility is that Chinese children give clearer explanations due to the stronger emphasis of considerateness as an explicit cultural norm. For instance, an allegory widely taught to Chinese preschoolers describes a 4-year-old boy named Kong Rong giving away a bigger pear to other

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people, not only highlighting the value of being considerate of other people's needs, but also making it an explicit moral imperative. However, we remain cautious about interpreting this difference as strong evidence for a cross-cultural difference, given that these effects were absent in Studies 2 and 3.

What underlies the development between ages 4 and 6? Given prior work that suggests 4-year-olds already understand the value of diversity (Echelbarger & Gelman, 2017), it is unlikely that younger children in our study simply failed to appreciate the value of having a choice. One possibility is that younger children's failures reflect a genuine inability to infer the *indirect, secondary* prosocial intention (i.e., leaving a choice for others) behind a primarily self-serving action (i.e., choosing a snack for oneself). The ability to evaluate others' actions based on their underlying intentions (rather than observable outcomes) continues to develop in late childhood (e.g., Cushman et al., 2013), even when these intentions are explicitly communicated. Younger children's failure in our study may not be so surprising given that the intentions of the protagonists had to be inferred from the context.

Leaving a choice for someone else is valuable especially when the

beneficiary's preference is unknown. Thus, additional knowledge about the beneficiary's preference might change these evaluations. For instance, the effect might be attenuated if Jenny knew Sophie's preference (e.g., Sophie prefers bananas over apples) and can act on that knowledge. Further work can investigate the interactions between the act of leaving choice and other aspects of children's mental state understanding.

Our findings are particularly noteworthy given prior work showing cultural variation in how much people value or desire the opportunity to choose (Iyengar & Lepper, 1999; Savani et al., 2010). The current findings suggest that despite the potential individual differences in the subjective value of choice, children and adults in both the US and China overall consider having a choice as something desirable. Certainly even in societies that value choice, having too many choices can become a burden and induce cognitive overload (Schwartz, 2004). Whether, and in what contexts, children understand the *cost of having a choice* remains an interesting question for future work.

Humans, even at a young age, are highly attuned to others' actions. Even in the

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case of self-serving actions, we think about their consequences for others and evaluate others' actions based on their underlying social intentions. Our work provides a first step towards understanding the social-cognitive capacities underlying these sophisticated intuitions as well as how they develop in childhood.

**Open Science Practice**

All study materials, data and pre-registration information have been made publicly available via the Open Science Framework and can be accessed at https://osf.io/y4vx3/?view_only=8e939b212b3f469a940056e945b28515.

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## Supplementary Materials

In all three studies, after the main question, we also asked: "If you are going to choose one from Bella and Jenny to play with, *who would you prefer to play with*?" We included this question as an exploratory measure to examine whether children's friend preference is influenced by their social evaluation. However, due to concerns about the potential influence of repeated questioning (Gonzalez, Shafto, Bonawtiz, & Gopnik, 2012), we report the results in Supplementary Materials. Below we report the proportion of participants who chose the friend who left a choice.

### Study 1

Adults: 97% (US, $p < .001$) and 92% (China, $p < .001$)

Children: 66% (US) and 59% (China); no effect of age ($p = .59$) nor culture ($p$

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= .48).

Children's explanations: Very few (3% in the U.S., 10% in China) referred to the available options the first person has or the fruits left for the second person following this question.

**Study 2**

**The Positive/Neutral condition**.

Adults: 84.8% (US, $p < .001$) and 87.2% (China, $p < .001$)

Children: 47% (US) and 49% (China); no effect of age ($p = .12$) nor culture ($p = .61$).

Children's explanations: Very few (1% in the U.S., 4% in China) referred to the available options the first person has or the fruits left for the second person to following this question.

**The Negative/Neutral condition.**

Adults: 88.2% (US, $p < .001$) and 75.7% (China, $p < .001$)

Children: 61% (US) and 66% (China); no effect of age ($p = .84$) nor culture ($p = .48$).

Children's explanations: Very few (2% in the U.S., 7% in China) referred to the available options the first person has or the fruits left for the second person to following this question.

**Study 3**

Children: 39% (US) and 57% (China)

Children's explanations: Very few (0% in the U.S., 3.33% in China) referred to the available options the first person has or the fruits left for the second person to following this question.

CHAPTER 5

CONCLUSION

How do views about choice develop in childhood across cultural contexts, and how do these views guide children's own actions and their evaluations of others' actions? These questions, relevant to children's social and cognitive development, lies at the heart of my research.

The research presented in this dissertation supports the idea that children in preschool years and middle childhood demonstrated increasingly mature intuitions about choice. During the early and middle childhood, they increasingly view it as a choice to act against internal desires, and the development of such views have important relation with their self-regulatory behaviors (Chapter 2); they increasingly considering the psychological and physical costs in one's prosocial decisions (Chapter 3), and they increasingly recognize the prosocial value of giving others the freedom to choose (Chapter 4). Culture seems to play a big role in how our behaviors are related to our beliefs about choice: Cultural contexts moderate the relationship between views about choice to act against desires and children's inhibitory control behaviors (Chapter

2). However, when found large cultural similarities in children's understanding of the prosocial value of leaving the opportunity to choose for others (Chapter 4).

Although even infants seem to have at least a rudimentary understanding of agency and choice (Gergely, Bekkering, & Király, 2002; Brandone & Wellman, 2009), based on the findings in this dissertation, I would argue that preschool years and middle childhood is a period that they gradually develop more sophisticated understanding of choice and incorporate their physical, psychological and socio-moral understandings into their views about choice. Our research also suggests that these developing views about choice have a substantial impact on their self-regulation and socio-moral cognition/behaviors. Findings in this dissertation advances the emerging literature on children's views about choice and alternative actions.

The current dissertation also adds to prior cross-cultural investigation on adults' and children's views about choice. Prior work has mainly focused on the emphasis on independent versus interdependent factors as influencing one's views about choice (Iyengar & DeVoe, 2003; Chernyak et al., 2013; 2019). The current study extends on prior work and suggests potentially different routes one's beliefs may

relate to their behaviors. Due to different emphases on cultural values, children across

cultures may make different attributions and interpretations of their behavioral

experience and thus form different beliefs about choice. These different beliefs may

also further influence their behaviors in specific cultures. This suggests that the

importance of not only investigating the cultural similarities and differences on beliefs

(e.g. self-views) or behaviors (e.g., executive functions), but also investigating how

the interaction of the two together foster children's development in specific culture.

Even though children across cultures may arrive at the same developmental outcomes,

the way they get there may be different. This is consistent with prior work showing

that different interventions work for Theory of mind development in U.S. vs. Chinese

children (Lu, Su, & Wang, 2008). This would have important practical implications on

how to promote behavioral performance through different mindsets in different

cultures.

### *Implications for Future Research*

The findings in the current dissertation point to several important areas for

future research.

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First, what are the developmental mechanisms underlying children's developing understanding of choice? What factors contribute to children's developing beliefs about choice across cultures? One aspect may be parent-child conversations. Parents' values and beliefs about choice may be transmitted to children through daily conversations. In an ongoing study, I am investigating how U.S. and Chinese parents talk about choices and constraints on choices (e.g. conventional and moral norms, personal preferences) with their children. This investigation would help shed light on what implications parent-child conversations may have on children's views about choices.

Another aspect that may be important in children's developing beliefs about choice may be their own experience of making choices, especially making hard choices, performing actions with alternative possibilities. Some relevant work (Chernyak & Kushnir, 2013) suggests that one's own experience of making costly choice make children more likely to see themselves as prosocial agents, and thus share more in subsequent sharing task. There is also recent evidence (Wente et al., in prep) showing that children's own experience in self-control tasks can influence their beliefs

about choice to overcome desires. Observing others' choice-making and contemplating on that may also contribute to developing views about choices. For example, as children have more experience comparing observed actions one does with possible alternative actions one could have performed, they may have better understanding of the costliness of choice etc. In future work, I plan to investigate the contributing factors by looking at these different routes.

Second, children's beliefs about choice may have important implications for their academic achievement. Future research can investigate how children view about choices in relation to various types of constraints ranging from external environments (educational resources, parental support, stereotypes etc) to internal factors (e.g. intelligence, talent etc). How do children view these constraints? Do they think one can choose to act against such constraints? For example, can someone choose to become president or a mathematician even though they are not good at maths? Previous work has shown the important role of mindset in children's academic performance (Dweck, 2007). It is crucial to study the implications of beliefs about choice to overcome various constraints have on children's learning and academic

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development, as well as the relationship between these beliefs to major behavioral developmental outcomes.

A related question would be whether and how do children make sense of the costs of choices in the academic domain. Supposedly that someone who has more talent may needs to make more effort and take larger cost to succeed academically than someone who has less talent. Whether and when do children view the latter person as more praiseworthy than the first person? When do children recognize the importance and positivity of taking efforts and working hard? This may also have important implications on whether they themselves would put in effort and take the costs to work on something they do not have much talent in. These would be important questions for future work.

Third, as we have shown that children consider the costliness of choice and the prosocial value of choice in their social evaluations. Future research can investigate the role of choice in children's own prosocial behaviors (Chernyak & Kushnir, 2018). Do children themselves incur costs to help others? Do children themselves give others the freedom to choose? And how can we promote children's prosocial behaviors?

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In a nutshell, the dissertation has revealed that children increasingly incorporate their knowledge of the physical world, the socio-moral world and the mental world to form a more sophisticated and mature understanding of choice; and these understanding inform their own behaviors and their interpretations of others' behaviors. Each of these studies adds to the growing body of work on children's social cognitive development and views about choice in particular. It also opens fruitful area for future research.

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APPENDICES

APPENDIX A: Chapter 1 Free Will Questionnaire

American Version:

**Desire Free Will Task**

Simple, free choice (control question):

Peter draws a picture every day. He always uses a color pencil to draw his picture. But today, he wants to do something different. Peter **wants** to draw his picture with a crayon. Even though he usually uses a color pencil, can Peter **just choose to** draw his picture with a crayon anyway?

Why?

Physically constrained (control question):

Bobby walks to the store every day. He always walks around the big brick wall. But today, he wants to do something different. Bobby **wants** to walk <u>right through</u> the big brick wall.   Even though the wall is made of bricks, can Bobby **just choose to** walk right through the wall anyway?

Why?

Desire inhibition activity with explanation (experimental question):

Let's imagine there is a box on the table. Sally sees the box and she does not know what is inside. Sally **wants to know** about the box. She thinks there might be something good in the box.   Even though she wants to know about the box, can Sally just choose **not to** look into the box or does she **have to** look into the box (alternatively: does Sally **have to** look in the box because she's curious, or can she just **choose** not to look into the box)? (choose to or have to asked first)

Why?

Desire action activity with explanation (experimental question):

Let's imagine there is a cupboard here. Susan sees the cupboard and she does not know what is inside. Susan is scared of the cupboard. She thinks there might be something scary in the cupboard.   Even though she is scared of it, can Susan **just choose to** look into the cupboard, or does she **have to not** look into the cupboard (alternatively: Does susan **have to not** look in the into the cupboard because she's scared, or can she just **choose to** look into the cupboard)? (choose to or have to asked first)

Why?

Desire inhibition food with explanation (experimental question):

Let's imagine that there is a piece of cereal/cornflake on the table. Sophie sees the cereal and she likes it. Sophie thinks the cereal/cornflake tastes good. Even though she likes it, can Sophie **just choose not to** eat the cereal/cornflake, or does she **have to** eat the cereal/cornflake (alternatively: Does Sophie **have to** eat the cornflake because she likes it, or can she **choose to not** eat it)? (choose to or have to asked first)

Why?

Desire action food with explanation (experimental question):

Let's imagine that there is a cracker/biscuit on the table in front of us. Rosie sees the cracker/biscuit and she doesn't like it. Rosie thinks the cracker/biscuit tastes yucky. Even though she does not like it, can Rosie **just choose to** eat the cracker/biscuit, or does she **have to not** eat the cracker/biscuit (alternatively: does Rosie **have to not** eat the cracker because she does not like it, or can rosie just **choose to** eat it)? (choose to or have to asked first)

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Why?

**Norm Free Will Task**

Harm:

Johnny sees his friends every day. He always plays with his friends nicely. But today, Johnny wants to do something different. Johnny **wants** to hit his friends.   Is it ok for Johnny to hit his friends? Why/why not?

Ok, even though it's …[not nice] Can Johnny **just choose to** hit his friends today anyway?

Why?

Unfairness:

Rory's mom gives Rory some candies to share between her brother and herself. Rory always gives half the candy to her brother, and takes half of them for herself. But today, Rory wants to do something different. Rory **wants** to take all of the candies for herself.   Is it ok for Rory to take all of the candies for herself? Why/why not?

Ok, even though it's… [not fair] can Rory **just choose to** take all of the candies for herself anyway?

Why?

Prudential:

Polly's parents tell her not to lift her little sister because she's too heavy for Polly and Polly might get hurt. Polly always listens to her parents and doesn't lift her little sister. But today, Polly wants to do something different. Polly wants to lift her little sister.   Is it ok for Polly to lift her little sister? Why/Why not?

Ok. Even though it's...[not safe] can Polly **just choose** to lift her little sister anyway?

Why?

<div align="center">Chinese Version:</div>

Desire Free Will Task:

Simple, free choice (control question)

乐乐每天都画一张画。他每次都会用彩色铅笔来画画。但是今天，他想做一些不同的事情，乐乐想要用蜡笔来画画。即使他通常用彩色铅笔，乐乐可以选择用蜡笔来画画吗？

为什么？

Physically constrained (control question)

小明每天都走去商店。他每次都会绕过一面大砖墙。但是今天他想做一些不同的事情。小明想直接穿过那面大砖墙。虽然墙是砖头做的，小明可以选择直接穿过那面墙吗？

为什么？

Desire inhibition activity with explanation (experimental question)

我们想象这桌子上有一个盒子。妮妮看到了这个盒子，她不知道盒子里有什么。妮妮对这个盒子感到很好奇。她觉得里面一定有什么好玩的东西。即使她很好奇，妮妮可以选择不看这个盒子吗还是她一定要看看盒子里有什么呢？（妮妮因为好奇就一定要看一下盒子呢还是她可以选择不看呢？）

为什么？

Desire action activity with explanation (experimental question)

我们想象这里有一个柜子。贝贝看到了这个柜子，她不知道里面有什么。贝贝对柜子感到很害怕。她觉得柜子里面可能有什么可怕的东西。即使贝贝感到很害怕，她可以选择看一下柜子里有什么呢，还是她就一定不看呢？（贝贝因为害怕就一定不看盒子里有什么呢，还是她也可以选择看一下呢？）

为什么？

Desire inhibition food with explanation (experimental question)

我们想象这桌子上有一块儿蛋糕。欢欢看到了这块儿蛋糕她很喜欢。欢欢觉得这个蛋糕很好吃。即使她很喜欢，欢欢可以选择不吃这块蛋糕吗，还是她就一定不吃呢？（欢欢因为喜欢就一定要吃这块蛋糕呢，还是她也可以选择不吃呢？）

为什么？

Desire action food with explanation (experimental question)

我们想象这桌子上有一块饼干。飞飞看到了这块饼干，他不喜欢饼干。飞飞觉得这饼干一定很难吃。即使他不喜欢，他可以选择尝一下吗，还是他就一定不吃呢？（飞飞因为不喜欢就一定不吃这饼干呢，还是他也可以选择尝一下呢？）

为什么？

**Norm Free Will Task**

Harm:

小刚每天都见他的朋友。他总是和他的朋友玩儿得很好。但是今天，他想做一些不同的事情。小刚想要打他的朋友。

小刚打他的朋友是正确的吗？为什么？

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即使。。（这是不友好的），今天小刚可以选择打他的朋友吗？

Unfairness:

小华的妈妈给了他一些糖果让他跟他弟弟分。小华总是把一半的糖果给他弟弟，自己留下一半。但是今天，小华想做一些不同的事情。小华想要把所有的糖都留给自己。

小华把所有的糖都留给自己是正确的吗？为什么?

即使这是。。。（不公平的）小华可以选择把所有的糖都留给自己吗？

Prudential:

丽丽的父母告诉她不能把妹妹抱起来，因为妹妹太重了，丽丽可能会受伤。丽丽每次都听爸爸妈妈的话，没有把妹妹抱起来。但是今天，丽丽想做一些不同的事情。丽丽想要把妹妹抱起来。

丽丽把她的妹妹抱起来这件事是正确的吗？为什么?

即使。。（这不安全），丽丽可以选择把妹妹抱起来吗？

APPENDIX B: Chapter 2 Protocol Example (Study 1)

English Version

Hi, XX. In today's game, I want to tell you a story about Sophie and her

friends.

This is Sophie. Sophie has two friends at school. This is Bella, and this is Jenny.

Which one is Jenny? Which one is Bella?

Well done.

You know what? Sophie really loves snacks. Her favorite time at school is the snack time.

During the snack time, she sits at the same table with her friends. Everyone at the table lines up to take turns to choose a snack from the teacher's basket. Each person gets only one snack from the teacher. And you need to wait for the person in front of you when you line up.

Everyday at their school, they have two snack times everyday, one in the morning and one in the afternoon.

Today, the snacks are apples and bananas.

Now it's snack time in the morning. Sophie sits next to Bella at the table. Everyone at her table lines up to take turns to choose a snack from the teacher's basket.

Bella stands in front of Sophie, so Bella is going to choose first, Sophie is going to choose after Bella. Who's gonna choose first? Who's gonna choose after? Okay when it comes to Bella… see What are in the teacher's basket for Bella to choose from?

That's right. 2 apples and 1 banana! Now let's see which one Bella is going to choose. Ha! Bella chooses an apple. See, Bella chooses an apple. Now, what's left in the basket for Sophie to choose from?

That's right. Sophie then chooses between an apple and a banana.

Now, it's snack time in the afternoon. Sophie sits next to Jenny at the table. Everyone at her table lines up to take turns to choose a snack from the teacher's basket. Jenny stands in front of Sophie, so Jenny is going to choose first, Sophie is going to choose after Jenny. Who's gonna choose first? Who's gonna choose after? When it comes to Jenny… see What are in the teacher's basket for Jenny to choose from?

That's right. Now let's see which one Jenny is going to choose. Ha! She chooses the apple. See, Jenny chooses the apple. Now, what're left in the basket for Sophie to choose from?

That's right. Sophie then chooses between two bananas.

Alright, let's look at it again.

You remember, in the morning snack time, what did Bella choose?

Right. Then what did she leave in the basket for Sophie to choose from?

In the afternoon, What did Jenny choose?

Then what did she leave in the basket for Sophie to choose from?

Alright, now I have a question for you, Bella or Jenny, who do you think is a nicer friend to Sophie? Why?

Now if you are going to choose one from Bella and Jenny to play with. Who would you prefer to play with, Bella or Jenny? Why?

<div align="center">Chinese Version</div>

你好，小朋友。在今天的游戏中，我想要给你讲一个有关贝贝和她的朋友的故事。

这是贝贝.贝贝在学校有两个好朋友。这个是乐乐，这个是欢欢.

哪一个是乐乐，哪一个是欢欢？

很好.

你知道吗？贝贝很喜欢吃水果加餐。在学校，她最开心的时候就是领水果加餐

的时候。

在加餐时间，贝贝和她的朋友坐在一起。每一个小朋友都排队轮流从老师那里拿加餐，每人每次只能拿一个。排在后面的小朋友要等排在前面的小朋友选完才能选。

每天他们学校有两次水果加餐时间，一次在上午，一次在下午。

今天，加餐是苹果和香蕉。

现在是上午的加餐时间。贝贝和欢欢坐在一起。每个人都要排队轮流从老师那里选一个水果。欢欢排在前面，欢欢先选，贝贝在欢欢之后选。谁先选？谁后选？好的，当轮到欢欢的时候， 看，老师这里有什么欢欢可以选择的水果呢？

很好。2个苹果一个香蕉！让我们看看欢欢要选哪个呢？哈！欢欢选择了一个苹果。 看欢欢选择了一个苹果。看，欢欢选择了选了一个苹果。 现在，这里剩下了什么给贝贝来选呢？

C: 一个苹果和一个香蕉！

对！贝贝要从一个苹果和一个香蕉当中选一个。

现在呢，是下午的加餐时间。贝贝和乐乐坐在一起。每个人都要排队轮流从老师那里选一个水果。乐乐排在前面，先选，贝贝在乐乐之后选。谁先选？谁后选？当轮到乐乐的时候， 看，老师这里有什么乐乐可以选择的水果呢？

很好。2 个香蕉一个苹果！让我们看看乐乐要选哪个呢？哈！乐乐选择了一个苹果。 看乐乐选择了一个苹果。看，乐乐选择了选了一个苹果。 现在，剩了什么给贝贝来选呢？

对,贝贝要从两个香蕉中选一个。


好的，让我们再来从头看一看

你还记得吗？在早上的加餐时间，欢欢选了什么？

对，那么她留下什么给贝贝选呢对？

在下午的加餐时间，乐乐选了什么

对，那么她留下什么给贝贝选呢？

好的，现在我要问你，欢欢和乐乐，你觉得谁对于贝贝来说是个更好的朋友呢？为什么？

现在呢，如果在欢欢和乐乐中选一个来一起玩儿，你会选谁呢？为什么？

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APPENDIX C: Chapter 3 Full List of Story Items

Study 1

Helping:

"Low Psychological Cost" Character:

This is Eva, and this is Eva's brother. Eva's brother lost his favorite ball. He has been looking really hard, but he still hasn't found it. So he asked Eva to help him look for it.

Helping people is the right thing to do. Eva's friends are playing right outside. But Eva doesn't like playing outside. She doesn't want to go play with her friends right now.

So Eva helped her brother look for his ball. It was really easy for Eva to help her brother because she didn't want to play with her friends at all.   So Eva helped her brother.

"High Psychological Cost" Character:

This is Mary, and this is Mary's brother. Mary's brother lost his favorite ball. He has been looking really hard, but he still hasn't found it. So he asked Mary to help

him look for it.

Helping people is the right thing to do. Mary's friends are playing right outside. Mary likes playing outside.    She wants to go play with her friends right now.

But Mary helped her brother look for his ball. It was really hard for Mary to help her brother because she wanted to play outside with her friends. But Mary helped her brother anyway.

Honesty:

"High Psychological Cost" Character:

This is Tiffany, and this is Tiffany's mom. Tiffany accidentally broke her mom's vase when she was playing with her toy airplane. When Tiffany's mom came home from work, she asked Tiffany what happened.

Telling the truth is the right thing to do. But if Tiffany tells her mom that she broke the vase, her mom might take her toy airplane away. Tiffany likes her toy airplane, and she'll be sad if her mom takes it away. Tiffany wants to play with her toy airplane.

"Low Psychological Cost" Character:

This is Ana, and this is Ana's mom. Ana accidentally broke her mom's vase when she was playing with her toy airplane. When Ana's mom came home from work, she asked Ana what happened.

Telling the truth is the right thing to do. But if Ana tells her mom that she broke the vase, her mom might take her toy airplane away. Ana doesn't like her toy airplane, so she won't be sad if her mom takes it away. Ana doesn't want to play with her toy airplane.

So Ana told her mom that she broke the vase. It was really easy for Ana to tell the truth because she didn't like her toy airplane. So Ana told her mom the truth.

Dishes:

"Low Psychological Cost" Character:

This is Julia and this is Julia's mom. Julia's mom told her to clean up the dishes after dinner.

Doing what mom says is the right thing to do. But Julia remembers that her favorite TV show is starting. Julia doesn't like watching the TV show. She doesn't want to go watch the TV show right now.

Doing what mom says is the right thing to do. But Julia remembers that her favorite TV show is starting. Julia doesn't like watching the TV show. She doesn't want to go watch the TV show right now.

So Julia cleaned up the dishes. It was really easy for Julia to clean up the dishes because she didn't want to watch the TV show at all. So she cleaned up the dishes.

"High Psychological Cost" Character:

This is Tina and this is Tina's mom. Tina's mom told her to clean up the dishes after dinner.

Doing what mom says is the right thing to do. But Tina remembers that her favorite TV show is starting. Tina likes watching the TV show. She wants to go watch the TV show right now.

But Tina cleaned up the dishes. It was really hard for Tina to clean up the dishes because she wanted to watch the TV show. But she cleaned up the dishes anyway.

Toys:

"High Psychological Cost" Character:

This is Jessica, and this is Jessica's mom. Jessica's mom told her to play with blocks after dinner.

Following what mom says is the right thing to do. Then Jessica sees a new marble run on the ground. Jessica likes playing with the marble run. She wants to play with the marble run right now.

Jessica played with blocks after dinner. It was really hard for Jessica to play with blocks, because she also wanted to play with the marble run. But Jessica played with blocks anyway.

"Low Psychological Cost" Character:

This is Monica, and this is Monica's mom. Monica's mom told her to play with blocks after dinner.

Following what mom says is the right thing to do. Then Monica sees a new marble run on the ground. Monica doesn't like playing with the marble run. She doesn't want to play with the marble run right now.

Monica played with blocks after dinner. It was really easy for Monica to play

with blocks, because she didn't want to play with the marble run. So Monica played with blocks.

Study 2 Physical Stories

Helping Physical:

"Low Physical Cost" character:

This is Mia, and this is Mia's brother. Mia's brother lost his favorite ball. He has been looking really hard, but he still hasn't found it. So he asked Mia to help him look for it.

Helping people is the right thing to do. Mia sees that the ball is behind the sofa right next to her. So to help her brother get his ball, Mia just needs to walk behind the sofa and pick up the ball.

So Mia helped her brother get the ball. It was easy for Mia to help his brother because the ball was just behind the sofa right next to Mia. So Mia helped her brother get his ball.

"High Physical Cost" character:

This is Mary, and this is Mary's brother. Mary's brother lost his favorite ball. He has been looking really hard, but he still hasn't found it. So he asked Mary to help him look for it.

Helping people is the right thing to do. Mary sees that the ball is stuck on the top of the stairs. So to help her brother get the ball, Mary has to walk all the way up to the stairs and pick up the ball.

But Mary helped her brother get his ball. It was really hard for Mary to help her brother because the ball was stuck at the top of the stairs. But Mary still helped her brother get his ball.

Dishes Physical:

"High Physical Cost" character:

This is Jessica and this is Jessica's mom. Jessica's mom told her to clean up the table after dinner.

Doing what mom says is the right thing to do. Look there are a lot of dishes on the table. To clean up the table, Jessica needs to clean up all those dishes.

But Jessica cleaned up all the dishes on the table. It was really hard for Jessica

to clean up the table because there were a lot of dishes on the table. But she cleaned up the dishes anyway.

"Low Physical Cost" character:

This is Monica and this is Monica's mom. Monica's mom told her to clean up the table after dinner.

Doing what mom says is the right thing to do. Look there are only a few dishes on the table. To clean the table, Monica only needs to clean up these few dishes.

So Monica cleaned up the dishes. It was really easy for Monica to clean up the dishes because there were only a few dishes on the table. So she cleaned up the few dishes.