THE UNIVERSITY OF CHICAGO

FLEXIBLE FAIRNESS:

HOW CONTEXT SHAPES SOCIAL PREFERENCES

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE DIVISION OF THE SOCIAL SCIENCES

DEPARTMENT OF PSYCHOLOGY

AND

THE FACULTY OF THE UNIVERSITY OF CHICAGO

BOOTH SCHOOL OF BUSINESS

IN CANDIDACY FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

BY

ELIZABETH LIGHTMAN HUPPERT

CHICAGO, ILLINOIS

AUGUST 2022

Table of Contents

List of Tables

List of Figures

Acknowledgements

First and foremost, I would like to acknowledge my dissertation committee for their mentorship and support. Thank you to Jean Decety for taking a chance on me five years ago and forging the collaborations to make this research possible. Thank you to Alex Shaw for sharing his expertise in the development of fairness and teaching me how to be a critical scientist. Thank you to Emma Levine for her exceptional mentorship and guidance in navigating the joint program and for helping me grow as a researcher of moral psychology. Thank you to Jane Risen for her help in making this work stronger through her insightful comments. I am deeply grateful for the encouragement and mentorship from you all.

In addition to my committee, I am grateful for the help of numerous scholars and collaborators around the globe, including other students and research assistants, without whom this work would not be possible. I would especially like to acknowledge members of the Social Cognitive Neuroscience Laboratory, Child NeuroSuite, and Honesty, Opportunity, Prosociality & Ethics (HOPE) Laboratory for providing feedback on this work, as well as for their support and friendship over the past five years.

Finally, I would like to thank my family and friends for supporting me throughout graduate school. I would especially like to thank Mika Armenta for her encouragement, humor, and friendship – Mika, I could not have done it without you by my side these five years. I would also like to thank my parents, George Huppert and Harriet Lightman, for instilling a love of learning in me and inspiring me to pursue a doctoral degree. Thank you to my partner, Alex Jania, for listening to endless practice talks, asking all the hard questions, and providing immeasurable support in all areas of life. I also have a special thank you for Ira James Jania, who grew alongside this dissertation and helped me maintain perspective and motivation. I love you.

Abstract

Fairness influences social interactions from infancy to adulthood. However, the ways in which people conceive of fairness differs across ages and contexts. In this dissertation, I explore the developmental trajectory of fairness preferences across cultures and examine the impact of various contextual factors – from country to wealth to recipient need - on sharing behaviors and fairness judgments in middle childhood. In Chapter 1, I find that hunger – an aspect of the internal environment – is associated with less sharing of resources but does not change expectations of how others will share. I find no effect of hunger on children's evaluations of equal and equitable distributions between hungry and full recipients. Children are more likely to endorse equitable distributions as they get older, regardless of their own hunger. In Chapter 2, I also find that children are more likely to endorse equity over equality in third-party distributions as they get older. This age-related trend persists across 13 countries; however, levels of individualism and collectivism within a country – an aspect of the broader social environment - impacts the age at which this shift occurs and the magnitude of the equity preference. In Chapter 3, I examine interactions between the internal and external environment. I consider whether hunger, resource, and income levels interact in three different countries to predict children's sharing with hungry and full recipients. Children are more likely to share with a hungry over a full recipient as they get older, consistent with the pattern of third-party evaluations in Chapters 1 and 2. Children's own hunger and income levels do not influence costly sharing in this study, suggesting that children may override their own need in this context, when the recipient is needy, even if they did not do so in Chapter 1, when the recipient was anonymous. Chapters 2 and 3 also highlight variability in the developmental trajectory of fairness preferences across countries. I show that these differences in sharing are not associated with age-related differences in related

social cognitive abilities and, instead, suggest that an enhanced awareness of social norms plays an important role in these country-level differences. Taken together, I find that children exhibit flexibility in their conceptions of fairness in middle childhood and argue that heightened sensitivity to social information in the decision context supports mature fairness concerns.

Introduction

Fairness concerns permeate social life from infancy to adulthood. A child may be upset for receiving less candies or toys than their sibling, a student may be angered by a grade that feels inadequate compared to the time they spent studying, and adults might exhibit concerns for fairness when arguing for higher pay at work, deciding how to tip a waiter, or sharing a particularly good dessert with their partner. Although the importance of fairness is well-established across diverse societies (Graham et al., 2011; Blake et al., 2015a), the origins of, and mechanisms promoting, fairness concerns remain under debate.

Some have argued that fairness concerns reflect basic evolutionary goals of encouraging reciprocity and maintaining group success, even in nonhumans species. For example, capuchin monkeys reject food resources that they previously enjoyed when they see a neighboring monkey receiving a more valued food resource (Brosnan & de Waal, 2003). Dogs also show sensitivity to the rewards that other dogs receive. If one dog receives a treat for performing a command, then a neighboring dog will refuse to perform the command for no treat. However, the dog will perform the command for no treat if no other dog is present, suggesting that the dog is responding to differential outcomes for the same behavior, rather than a lack of food (Range et al., 2012). An awareness and sensitivity towards having more or less than others in a group is likely helpful for maintaining cooperation in both nonhuman and human species (Brosnan & de Waal, 2014). Human infants also show an early awareness of fairness (Schmidt & Sommerville, 2011; Sloane et al., 2012), lending support to evolutionary arguments for a basic sense of fairness.

However, fairness concerns in infants and younger children are expressed differently than fairness concerns in older children and adults. As humans develop, they exhibit more complex reasoning about fair outcomes, which can encompass both equal outcomes and unequal

outcomes, and this type of reasoning appears to be uniquely human (Bräuer & Hanus, 2012). For example, unequal outcomes that are proportional to effort or contributions are considered fair in many circumstances (Adams, 1965; Almås et al., 2010). People also exhibit preferences for unequal societies, in which wealth is allocated unequally among citizens (Starmans et al., 2017). Furthermore, humans react poorly to third-party distributions that they consider unfair (McAuliffe et al., 2015), indicating that they care about enforcing norms of fairness, even if they are not personally affected by unfairness. This more nuanced – and arguably human-specific - sense of fairness can help promote cooperation in modern societies that depend on a coordinated production of resources (Henrich et al., 2010a; Shäfer et al., 2015). Rewarding group members for their contributions might help a group work harder and be more productive. Likewise, distributing more resources to the needy compared to those who already have plenty might eventually lead to more able society members who are able to contribute to group goals. In situations that require large-scale cooperation, as is often the case in modern societies, a concern for fairness that extends beyond equality and beyond the self is advantageous.

Yet, the optimal strategy for cooperation is likely to vary across contexts. Behaviors that lead to successful cooperation in one environment may not in another context because of a diverse range of factors, including the mobility of the community, natural resource levels, the degree of contact with other groups, environmental harshness, market integration, and prevalence of social institutions (Chudek & Henrich, 2011; Pepper & Nettle, 2017; Henrich et al., 2010a). People are likely to adjust their fairness behaviors based on what is necessary to succeed in varied communities, which can also lead to different reactions to (un)fairness across settings. Equality might be considered the fairest way to distribute resources in some communities, whereas merit-based equity, need-based equity, or efficiency concerns might be prioritized in

other settings (Deustch, 1975; Almås et al., 2010; Choshen-Hillel et al., 2020). Relationship structures can help to explain which types of fairness are generally prioritized in society. For example, some forager communities promote equality over merit-based equity by encouraging productive group members to demonstrate modesty and distribute resources across the group, which ultimately is useful for maintaining long-term relationships among the community (Shäfer et al., 2015). In larger societies that rely on more anonymous relationships in the exchange of goods, merit is often rewarded. Dyadic relationships can also impact individual fairness behaviors. For example, friendship can trump the importance of merit in children's allocation decisions in some contexts (Engelmann et al., 2021; Zhang, 2020). These findings highlight the importance of group relations and repeated interactions in shaping fairness concerns. Perceptions of what is fair are likely to vary based on setting and social group.

Past work provides evidence that people adjust their sharing and distribution behaviors to their context, resulting in variability in fairness preferences among older children and adults. People from societies with greater market integration endorse fairness with anonymous partners more than people from societies with less market integration, possibly because encouraging fairness among anonymous group members helps large-scale markets function effectively (Henrich et al., 2010a). Differences in fairness preferences have also been found between children from a suburban community in Germany, the Hai||om forager community in Africa, and the Samburu pastoralist community in Africa, which may be related to the number of repeated interactions that occur in these differently structured communities (Shäfer et al., 2015). While these studies indicate that differences in societal structure can impact fairness between communities, other contextual features also predict different fairness preferences within communities. For instance, people within the same city exhibit different fairness preferences

based on neighborhood wealth and socioeconomic status (Nettle et al., 2011; Safra et al., 2016). Hazda hunter-gathers demonstrate different concerns with fairness when they move between camp residences within the same broader community (Smith et al., 2018). People are also responsive to variations specific to the decision context, such as differences in recipient status (i.e., a friend versus a stranger versus a family member) or the value of the resource being distributed (Sheskin et al., 2016; Engelmann et al., 2021), leading to the endorsement of different fairness strategies. These findings indicate that a mature sense of fairness is flexible.

Taken together, past work provides evidence that fairness evolved to promote cooperative societies but the ways in which people think about fairness differs across ages and contexts (McAuliffe et al., 2017a). Having an initial sense of fairness, even at infancy, is advantageous for cooperation, but ultimately, being able to respond to more complex fairness dilemmas and conceive of fairness as more than equality is likely to enhance group success. The optimal way to think about fairness and promote cooperation will differ across settings, and variability in fairness preferences in older children and adults are well-documented. However, the mechanisms promoting this adaptability and flexibility in fairness are less clear.

In this dissertation, I show that variations in fairness behaviors and judgments are a response to contextual features in the decision environment. Although previous research has focused on social cognitive abilities as mechanisms underlying fairness preferences (Blake, 2018), like cognitive control and empathy, I argue that sensitivity to social context and norms is also a key mechanism, especially for supporting mature concerns with fairness. Using a developmental, cross-cultural perspective lends support to this argument by highlighting universal conceptions of fairness in early childhood, which become increasingly flexible and adaptative to contextual cues with age. I show that younger children (4-5-year-olds) in three

studies behaved similarly across contexts. I find that variations in conceptions of fairness across settings first emerge in middle childhood (starting between ages 5-8), around the same time that children show heightened sensitivity to social norms and are becoming increasingly integrated into society (House & Tomasello, 2018; House et al., 2013; Lancy, 2010).

Additionally, this dissertation extends previous research on variability in fairness preferences by considering a wider array of contextual factors than country or community residence. Past work examining variations in fairness behaviors and judgments has often focused on cross-cultural differences in terms of country or population (i.e., Blake et al., 2015a; Cowell et al., 2017; House et al., 2013). However, a comprehensive understanding of the role of context on the development of fairness preferences necessitates a consideration of both variations between groups and variations within a group, given the evidence for within-group variations in cooperative strategies (i.e., Nettle et al., 2011; Safra et al., 2016). Examining the impact of culture on decision-making across multiple levels of analysis can add insight into the mechanisms explaining variability in fairness (Amir & McAuliffe, 2020). In this dissertation, I consider the impact of hunger, income, levels of individualism and collectivism, country of residence, and social cues specific to the decision context (resource value and recipient need) on sharing behavior and fairness concerns in three chapters. Overall, I find that contextual factors, especially those related to culture, country, resource value, and recipient need, lead to variations in children's willingness to share their own resources and their evaluations of equal and equitable resource allocations between others, and these variations emerge during middle childhood.

To begin, I will review recent research on the developmental trajectory of fairness. In doing so, I highlight young children's concern with equal outcomes and their use of fairness as a self-interested strategy. As children get older, they enact fairness more readily in their own

behaviors and become more approving of unequal outcomes. They also exhibit other-regarding preferences and will endorse fairness even when it is costly to the self.

Next, I will discuss social cognitive mechanisms that have been proposed to explain this transition in children's sharing behavior and fairness judgments between younger and middle childhood. Not only do fairness behaviors and judgments evolve in middle childhood, but abilities like cognitive control and empathy also become more advanced in this time window. Consequently, past research has explained differences in younger and older children's fairness behaviors in relation to these mechanisms (Blake, 2018). While these abilities may continue to play a role in one's willingness to engage in fair behaviors throughout the lifespan, I argue that they cannot adequately explain variations in sharing behavior and fairness judgments during middle childhood and adulthood.

Rather, I suggest that social norms are likely to become increasingly important in predicting sharing behavior and fairness judgments in older children and adults. Middle childhood represents a time of heightened sensitivity to social norms (House & Tomasello, 2018; House et al., 2020a), and often involves more time outside of the home through school, extracurricular engagements, and peer play. These social experiences and interactions can allow for social learning. Whether through formal teaching or participation in cultural rituals and tasks, social learning occurs from a combination of children's observations, imitations, and exploration (Legare, 2017; 2019) As children enter middle childhood, they may also start to assume more adult-like abilities, such as participation in chores or care for younger siblings, and cultural learning occurs from participation in adult responsibilities as well (Lancy, 2010). In light of evolutionary arguments that fairness functions to promote cooperation, it would be advantageous for children to think flexibly about fairness as they engage more with society and to adjust their

conceptions of fairness based on the optimal strategy of cooperation in their unique context. In this discussion, I highlight the need for continued diversity in psychological research participants and experimental contexts, including contexts beyond country groupings, to examine the importance of sensitivity to social norms as a mechanism supporting fairness and directly test this claim.

Finally, after establishing the need for diverse participants and experimental settings in developmental psychology, I explain my goal to begin to address this gap in knowledge in this dissertation. I provide an overview of the experimental designs and key findings from three chapters, which together shed light on the developmental trajectory of fairness and the importance of social context in promoting variability in fairness preferences.

Fairness in Early Childhood

Concerns for fairness develop at a young age and are often expressed as a preference for equality. Infants as young as 15-months old look longer at unequal distributions than equal distributions, suggesting that unfair third-party distributions are unexpected and surprising to these infants (Schmidt & Sommerville, 2011; Sloane et al., 2012). By age three, children indicate that people should split resources equally between neutral recipients (Smith et al., 2013). They expect others to behave this way, and consequently, are willing to punish those who do not divide resources equally between third-party recipients (McAuliffe et al., 2015). Children will even go so far as to throw away a resource to maintain equality (Shaw & Olson, 2012). Young children view equality positively.

Although equality is often treated as a benchmark of fairness (McAuliffe et al., 2017a), children recognize that unequal distributions can also be fair. Children are accepting of unequal third-party resource allocations that prioritize equity, meaning that children think it is appropriate

for recipients who work more towards a task to receive more resources (e.g., Adams, 1965, equal pay for equal work). Two-year-old infants indicate surprise (measured by longer looking times) when two recipients receive equal rewards after contributing unequal work towards a task (Sloane et al., 2012). Three-and-four-year-old children prefer equality over equity when dividing resources themselves, but still recognize that merit is a reasonable justification to stray from equality (Baumard et al., 2012). These results suggest that young children approve of equitable distributions based on differences in work, consistent with conceptualizations of equity as output proportional to input (e.g., rewards proportional to amount of work; Deutsch, 1975), even if they still prefer equality over equity when choosing one distribution strategy.

Although young children expect equality in third-party evaluations, and view equity as justified and reasonable in some circumstances, they do not behave in-line with fairness norms when dividing their own resources. A knowledge-behavior gap exists between young children's fairness expectations and behaviors, such that they exhibit self-maximizing behaviors when they stand to gain in resources but also expect other people to behave fairly (Smith et al., 2013; Blake et al., 2015b; Blake, 2018). Children learn and understand the concept of fairness relatively early in development, but they care most about fairness at a young age when they need fairness to benefit *themselves* (McAuliffe et al., 2017a). For example, if a child receives one cookie, but their friend receives three cookies, then the child might care about fairness and attempt to rectify the unequal distribution of cookies because endorsing a fairness norm would lead the friend to share a second cookie. This same child may care less about fairness if they were the one with the three cookies instead. Prior research highlights the ways in which young children manage to simultaneously endorse fairness and acquire more resources. For example, three-to-five-year-old children distribute more stickers to themselves than a puppet if they contributed more to a task

than the puppet, indicating attention to merit, but children still keep half the stickers when they contributed less work than a puppet (Kanngiesser & Warneken, 2012). Young children demonstrate an appreciation for fairness in judgments and third-party allocations at a young age, but they employ fairness in their own behavior as a primarily self-interested strategy (McAuliffe et al., 2017a).

Fairness in Middle Childhood

As children get older, they become more other-regarding in their fairness preferences, which makes sense evolutionarily as a means of promoting cooperative societies (McAuliffe et al., 2017a). By the start of middle childhood (around 5-8 years), children exhibit a greater willingness to share their own resources with anonymous others (Hook & Cook, 1979; Benenson et al., 2007; Fehr et al., 2008). In these studies, endorsing fairness is costly; dividing resources equally leads to less resources for the distributors themselves. Not only do children pay a cost to make sure another recipient receives some rewards, but by age eight, children exhibit advantageous inequity aversion, meaning they react poorly to unequal outcomes in which they receive more resources than others (Blake & McAuliffe, 2011). These behaviors indicate a genuine concern for the welfare of others, marking a departure from the use of fairness as a self-interested strategy.

Children also become more sophisticated in their conceptualizations of fairness with age. They are increasingly likely to prefer equitable distributions over equal distributions (Schmidt et al., 2016). Children show approval for unequal distributions that are based on deservingness or need-based equity, not only traditional conceptualizations of merit-based equity (i.e., inputs for outputs). By age 5, children will share more with a poor over a wealthy recipient (Paulus, 2015), and between ages 5-8, children increasingly endorse equitable resource allocations that prioritize

giving more resources to a recipient with nothing over a recipient who already has plenty of resources (Rizzo & Killen, 2016). Not only do 5-8-years-olds stray from equality in this context when allocating resources themselves, but they also judge equal resource allocations between a recipient with no resources and a recipient with plenty of resources as less fair than equitable allocations. These evaluations signal a shift from mere acceptance of equity towards a preference for equity.

These studies show that a concern for fairness arises early in development, but fairness preferences evolve throughout childhood. Young children generally prefer equal third-party allocations, but also recognize that equity is a justified reason to stray from equality in some situations. Although young children understand the concept of fairness, especially as equality, they are self-maximizing when sharing their own resources. By middle childhood, children are more willing to share their own resources, thus enacting fairness in their actual behavior, and can think flexibly about what constitutes "fairness," shifting from a focus on equal outcomes to an understanding that unequal outcomes can also be fair, and sometimes even preferred.

Mechanisms Underlying Developmental Shifts in Sharing and Fairness Concerns

Past work has considered numerous potential explanations for these development trends, such as age-related increases in social cognitive abilities (Blake, 2018). Cognitive control, aspects of empathy and perspective-taking, and impression management concerns increase with age and have been implicated in sharing decisions (Steinbeis & Crone, 2016; Kozloff et al., 2021). For example, 6-9-year-olds are less likely to share after a task that depletes inhibitory control, though their understanding of what is fair does not change after the depletion task (Steinbeis, 2018). In other words, children between 6-9 know what it means to be fair but cognitive control affects their ability to act in-line with this norm. Encouraging inhibitory control

in 6-9-year-olds (i.e., reading a story in which a character enacts self-restraint) also increases sharing behavior (Steinbeis & Over, 2017). Empathy and Theory of Mind have also been found to predict greater prosociality and sharing behaviors in some contexts (Cowell et al., 2017). Finally, children may care more about appearing fair as they get older (Shaw et al., 2014). By age five, children are more willing to share when their peers are present (Engelmann et al., 2012; Engelmann et al., 2018; Martin & Olson, 2015), highlighting the importance of impression management and reputational concerns in sharing decisions.

While this past work provides potential explanations for why children's fairness concerns differ between early and middle childhood, it is less informative for explaining variations in children's fairness concerns during middle childhood. During middle childhood, some of these social cognitive abilities are likely relatively advanced across settings. For example, previous research finds that children across cultures exhibit similar age-related increases in empathy between ages 6-10 (Kozloff et al., 2021), but cross-cultural variations in costly sharing and inequity aversion emerge around this time as well (House et al., 2013; Blake et al., 2015a). In other words, children show divergences in fairness preferences across cultures in the same developmental time window that they show similarities in empathy across cultures. Furthermore, the mechanisms that contribute to shifts from self-maximizing to other-regarding behaviors are likely to be distinct from the mechanisms that contribute to complex third-party fairness evaluations related to factors like recipient status or effort. Cognitive control might explain differences in sharing, since giving up one's resources requires inhibition of selfish impulses (i.e., Steinbeis & Over, 2017; Blake, 2018), but it's not clear that enhanced cognitive control would change evaluations of resource distributions in which the child does not stand to gain in resources. Therefore, these previous candidate mechanisms might contribute to age-related

changes in costly sharing throughout the lifespan to some degree, but they cannot sufficiently explain the fact that fairness judgments also shift in middle childhood (i.e., Rizzo & Killen, 2016). Variations in social cognitive abilities, like cognitive control and empathy, still might be related to variations in fairness preferences during middle childhood, but they are unlikely to be the only explanation.

Rather, a heightened awareness of social cues and norms might become increasingly important for explaining variations in fairness preferences during middle childhood. Societies across diverse ecologies require different strategies for survival (Amir & McAuliffe, 2020), including social strategies, which can impact fairness priorities. For example, societies that emphasize economic productivity may prioritize equity over equality, if equitable distributions of resources allow people across an economic spectrum to engage in production and maximize societal output (Deutsch, 1975). In this conceptualization of equity, allocation of resources is based on the means of producing (i.e., giving more resources to a worker with scarce resources rather than a worker with plentiful resources allows for maximum production across workers) rather than as a reward for working more. On the other hand, societies that emphasize mutual respect may prefer equality over equity, since equality implies everyone has similar value and status, whereas social groups that focus on personal development, such as family and school settings, are likely to value need-based equity to try to promote well-being for everyone in the group (Deutsch, 1975).

Likewise, expectations around fairness may differ due to more subtle contextual factors within a decision context that can vary even within a society. For example, even if one society generally prioritizes equity based on deservingness (i.e., need, merit) and another generally prioritizes efficiency (regardless of deservingness), resource value can still influence the choice

between these distribution strategies. Children are more likely to favor equity when resource value is low and efficiency when resource value is high (Choshen-Hillel et al., 2020). Furthermore, features in the decision context and the broader environment may interact to predict distribution strategies. While children's endorsement of equity and efficiency was similarly influenced by resource value across three countries, culture still impacted the degree to which children were willing to endorse equity, possibly due to wealth differences among these three countries (Choshen-Hillel et al., 2020). Additionally, the nature of social relations within a decision context likely dictates fairness preferences. In one perspective, the relational models theory, social relations vary among four central categories of communal sharing (i.e., people try to treat everyone the same in relationships), authority ranking (i.e., people adhere to a social hierarchy in their relationships), equality matching (i.e., people try to achieve reciprocity and balanced outcomes in their relationships), and market pricing (i.e., people think about relations in terms of ratios and transactions), with implications for social expectations and behaviors (Fiske, 1992). For instance, merit-based fairness is a central focus in relationships that are governed by a market pricing mode, but egalitarian preferences will likely dictate relationships in an equality matching mode. People within a culture may vary in the extent that they rely on one mode or the other, but broader aspects of culture can also affect how these four modes are realized and valued in everyday interactions (Fiske, 1992). Together past research shows that factors in the social decision context – from resource value to wealth to cultural grouping to relationships - can impact cooperation and perceptions of fairness.

Furthermore, the time at which variability in fairness preferences emerges aligns with a time of increased sensitivity to social norms. Middle childhood is an important period for social learning, which is a key means of cultural transmission (Legare, 2017; 2019). Children

demonstrate a growing awareness of social norms and an enhanced ability to integrate these norms into decision-making during this time (House et al., 2013; House & Tomasello, 2018; Lancy & Grove, 2011). By age 6-8, children align their sharing decisions in a dictator game to match experimentally manipulated norms of behavior in the game (House et al., 2020a). This was found to be the case among children across eight different communities, indicating a similar responsive to norms across societies. By 7.5 years of age, children will match their sharing behavior to an adult's normative description of the right way to behave (House & Tomasello, 2018). There is evidence that children adjust their sharing behavior to mirror both injunctive and descriptive norms (McAuliffe et al., 2017b). Additionally, children increasingly show responsiveness to norms of third-party punishment between ages 6-12 years in multiple societies (House et al., 2020b). This body of work indicates that children possess a similar norm-psychology across settings, which likely allows children to adapt their sharing behavior during middle childhood to conform with local norms (House et al., 2020a).

To the extent that norms and expectations about what is considered fair vary across decision contexts, then an enhanced sensitivity to these norms is likely to play a role in predicting variability in fairness preferences. As reviewed, middle childhood is a key developmental time for both an increasing sensitivity to social norms and the emergence of flexible fairness conceptions across cultures (Blake et al., 2015a; House et al., 2013; House et al., 2020a; House et al., 2020b). Therefore, an enhanced sensitivity to social norms during middle childhood may promote the development of mature, and flexible, fairness preferences.

A Need for Contextual Diversity in Developmental Research

To further understand the role that an enhanced sensitivity to social norms plays in predicting variability in fairness preferences, it is necessary to examine sharing behavior and

fairness judgments across varied contexts. Research that examines similarities and differences in sharing behavior, fairness judgments, and related social cognitive abilities in different social contexts can add insight into the role of social norms relative to social cognitive abilities in predicting fairness preferences in middle childhood.

Research on the development of fairness suffers from the same "WEIRD" bias as much of psychological research (i.e., a focus on Western, Educated, Industrialized, Rich, Democratic societies; Henrich et al., 2010b; Nielsen et al., 2017). Furthermore, past developmental research has often focused on cultural differences in terms of country or residence (House et al., 2013; Cowell et al., 2017; Blake et al., 2015a). However, an exploration of norms should also consider how cultural differences within a country predict these preferences, since norms can be derived from sub-groups within a community, such as groups based on socioeconomic status, religion, gender, or ethnic membership. Indeed, a focus on majority groups within a community likely only adds insight into how mechanisms of fairness operate within the majority group, which does not necessarily mean that fairness operates the same way in other groups in the community (i.e., Bryan et al., 2021). Variations in norms and prosociality between sub-groups within a broader social context, such as groups that differ in income levels within the same country, may also highlight mechanisms of sharing behavior and fairness judgments that would not be evident from an analysis of culture alone (Amir & McAuliffe, 2020). For example, recruiting children to participate in studies from rich cities of diverse countries only adds insight into the role of country on fairness perceptions in rich urban areas, but cannot answer questions about how wealth discrepancies within a country contribute to the development of fairness concerns. Yet, cooperative behaviors have been found to vary by wealth even within the same city (Nettle et al., 2011; Safra et al., 2016), illustrating the importance of considering context beyond country.

Likewise, measuring children's fairness preferences with only one type of resource might not encompass the range of children's preferences. Instead, considering how children choose to share when resource value varies can offer a richer understanding of how children think about different distribution strategies and weigh competing fairness concerns (i.e., Choshen-Hillel et al., 2020). Working towards diversity in both participant samples and experimental decision contexts is necessary for understanding the mechanisms supporting variability in fairness preferences.

The Current Study

To address these questions, I examine children's willingness to share resources and their judgments of equal and unequal resource allocations across varied contexts. In addition to country of residence, I explore how variations in one's internal state, such as hunger levels, and the broader social environment, including levels of individualism and collectivism, income, and country, impact sharing behavior and fairness judgments in middle childhood. I also consider the role of other contextual factors in the social environment that are relevant to the child's decisions, such as recipient cues of need or deservingness and resource value. In doing so, I consider how both between-country factors and within-country factors contribute to decision-making. Furthermore, I examine how the development of executive functioning (which encompasses cognitive control) and empathy relate to these behaviors and judgments in middle childhood. In doing so, this dissertation adds insight into the developmental trajectory of fairness preferences and the role of social norms and context in shaping fairness preferences. Specifically, I address the following questions in my dissertation:

1) How do variations in internal states (i.e., hunger) influence children's sharing behavior with relevant (food) and non-relevant (sticker) resources within the same city?

2) How does hunger impact fairness evaluations regarding third-party distributions of food resources between hungry and full recipients?
3) How do levels of individualism and collectivism impact preferences for equity and equality when allocating resources?
4) How do different types of recipient deservingness (material need, emotional need, merit) impact preferences for equity and equality when allocating resources?
5) Do variations in internal states (i.e., hunger) and external environment (i.e., income) interact to influence sharing behavior and equity preferences?
6) Do executive functioning and empathy contribute to age-related changes in sharing behavior across countries?

To investigate these questions, I combine theory and methods from cross-cultural psychology, developmental psychology, and social cognition research in a series of three chapters. In doing so, I hope to identify the developmental trajectory of variability in fairness preferences and better understand the role of social environment in shaping flexible conceptualizations of fairness.

Overview of Chapters

In Chapter 1, I examine the impact of hunger – a ubiquitous and universal feeling – on children's prosocial behavior and fairness judgments. Children aged 4- to 9-years-old (N = 203) in Chicago, Illinois were given the opportunity to share or keep food resources and non-food resources with an anonymous other child in two sharing games. After each sharing game, children predicted how another child would behave in the same games. I find that hungrier children were less likely to share overall, but particularly when sharing food resources – a

resource relevant to their current state. However, children still expected fairness from others even when behaving differently themselves.

In this study, children were also asked to evaluate two third-party resource allocation scenarios using food resources between hungry and full recipients. In one scenario, ten food resources were allocated equally between recipients, and in the second scenario, ten food resources were allocated equitably between recipients, favoring the hungry. I find that hunger did not influence third-party resource allocation evaluations, but rather, positive evaluations of equitable third-party distributions increased with age across all children in the sample, regardless of hunger state.

Overall, Chapter 1 suggests that children's age-related fairness judgments are relatively stable in that they were unaffected by variations in their internal state - children predicted fair sharing from others and judged equity more positively than equality with age, no matter their own hunger level – yet their actual behavior was influenced by their hunger. By highlighting an asymmetry in children's own behavior and judgments of others' behavior when hungry, this study shows that children conceive of fairness similarly, but apply fairness principles flexibly, when hungry. Furthermore, I find that age is more influential for children's appreciation of equity than a match in need state between the child and a recipient.

In Chapter 2, I explore the role of a second contextual factor – levels of individualism and collectivism– in shaping fairness preferences. Children aged 4-to-11-years-old from 13 different countries, varying in terms of individualism and collectivism, participated in three versions of a third-party, contextualized distributive justice game. Children allocated an even number of resources between two hypothetical recipients in these games and the three versions differed in terms of the recipients: recipients either differed in terms of wealth of candies

("wealth"), effort on homework ("merit"), and injury ("empathy"). I find that younger children were more likely to split the candy resources equally (two and two) between the recipients. As children got older, they were more likely to deviate from equal distributions and share more with the more deserving recipient. Children gave more resources to a recipient poor in candies over the recipient rich in candies in the wealth condition, a hardworking recipient over a lazier recipient in the merit condition, and an injured recipient over a healthy recipient – though to a lesser extent - in the condition meant to elicit empathy. These results align with the age-related preferences for equity over equality from Chapter 1, which together highlight the fact that children consider fairness as more than equality as they get older.

Although this age-related pattern emerged in all 13 countries, differences in levels of individualism and collectivism, as measured by the Hofstede scale, predicted the extent to which children favored equity in each condition. Children from the more individualistic countries, rated higher on Hofstede's scale, endorsed equitable distributions to a greater degree than children from more collectivist cultures, lower on Hofstede's scale, when recipients differed in terms of material wealth and merit; however, children from the more collectivist cultures exhibited greater preferences to distribute resources equitably compared to children from more individualistic cultures when recipients differed in emotional need. Children from the more individualistic cultures also favored equitable distributions at an earlier age than children from more collectivist cultures overall, though equity preferences increased with age across all countries. These results demonstrate that children share similar intuitions about fairness across countries, but cultural context shapes the magnitude of equity preferences in middle childhood.

Results from Chapters 1 and 2 indicate that there are universal intuitions about fairness judgments that remain relatively stable even when there are variations in homeostatic state or

culture; and yet, context does still impact more subtle variations in these judgments (i.e., magnitude of an equity preference) and willingness to behave in line with these judgments (i.e., asymmetry in children's behavior and judgments when hungry). Building on these results, in Chapter 3, I consider the role of hunger, neighborhood income level, and country of residence in predicting children's sharing behavior and resource allocation decisions. Examining how hunger and income area interact to predict sharing of food and sticker resources with a hungry and a full recipient in three countries differing in terms of overall wealth and resource access (Bolivia, Cambodia, and Haiti) helps to understand the stability of fairness preferences and sharing behavior across diverse contexts during development. I also consider how executive functioning, or cognitive control, and empathy develop alongside these behaviors.

I find that children differ in the total number of resources that they share and in the ways in which they distribute resources between a hungry and a full recipient across countries. Children in Bolivia and Cambodia showed similar age-related increases in overall sharing but children in Haiti did not. However, these country differences in age-related sharing patterns were not mirrored by age-related differences in executive functioning or empathy, suggesting cultural factors in Haiti likely influenced sharing decisions more than cognitive control or empathy. Additionally, in all countries, children favored the hungry recipient more than the full recipient as they got older, particularly when sharing food resources, but the degree to which the hungry recipient was favored differed across countries. Children's own hunger and income did not influence these patterns, suggesting social norms within the broader cultural environments of Bolivia, Cambodia, and Haiti and cues of the specific decision context (i.e., recipient need and resource value) were the most influential factors (in relation to hunger, income, and social cognitive abilities) on sharing behavior and equity concerns in this study.

These three chapters aid in understanding the role of context in shaping flexible intuitions about fairness by comparing the effect of multiple types of contextual factors (hunger, income, culture, country, recipient cues, resource value) on children's sharing behavior and fairness judgments. Children did not uniformly judge equal distributions as the fairest, nor did they consistently divide resources equally themselves. Rather, equity-based distributions were often preferred to equality-based distributions, and these preferences were dependent on the wealth, merit, or need (hunger, vulnerability) of the recipient, as well as the child's own age and context. Overall, these findings indicate that children reason flexibly about fairness during middle childhood in response to information in their social world.

CHAPTER 1: THE EFFECT OF HUNGER ON CHILDREN'S SHARING BEHAVIOR AND FAIRNESS PREFERENCES[1]

To share or not to share? A large portion of developmental research has focused on children's behavior when confronted with this decision. From this broad research program, we know that children become more generous and show a greater concern with fairness between 4 and 9 years of age across cultures (Cowell et al., 2017; Huppert et al., 2019; Rochat et al., 2009). Despite these age-related changes, older children and adults are not uniformly generous and fair. Fairness is strongly influenced by situational factors such as recipient characteristics and resource value in allocation scenarios (e.g., Rizzo et al., 2016; Rizzo & Killen, 2016; Sigelman & Waitzman, 1991). Children's conceptions of fairness are also influenced by their own resource levels and needs. For instance, children from lower socioeconomic status have been shown to share less resources compared with peers of higher socioeconomic status (Safra et al., 2016; Benenson et al., 2007). Resource scarcity in the form of hunger is one such situational factor that is particularly pervasive and shown to influence adult fairness attitudes (Aarøe & Petersen, 2013), decrease willingness to donate money to charity (Briers et al., 2006), and lessen prosociality in costly sharing contexts (Petersen et al., 2014).

However, little research has investigated how children's resource allocations and fairness evaluations are influenced by their own hunger. Does experiencing hunger reduce children's willingness to share their resources? Does hunger shift children's judgments or expectations regarding generosity in other children? The current study attempted to answer these questions by assessing the impact of hunger on children's sharing behavior and fairness preferences in order

[1] A version of Chapter 1 has been published as: Huppert, E., Shaw, A., & Decety, J. (2020). The effect of hunger on children's sharing behavior and fairness preferences. *Journal of Experimental Child Psychology, 192*, 104786.

to better understand the role of situational factors on children's developing prosociality. Determining the influence of hunger on children's sharing behavior and expectations is critical for understanding the importance that children attach to behaving fairly and the extent to which they integrate contextual cues into their fairness conceptions.

Although there has been no research examining how children's own hunger influences their sharing with others, there is research demonstrating both that children understand hunger as a state of deprivation and that they think others should share more with hungry recipients. Children aged 6– 8 years understand that hunger changes the subjective value that people place on resources, particularly food resources; they expect hungry people to search longer for food resources and fight harder to win conflicts over food (Pietraszewski & Shaw, 2015). Although children have a strong tendency to share resources equally, they are increasingly likely to divide food resources unequally in favor of hungry recipients between 5 and 8 years of age (Schmidt et al., 2016). Children take hunger cues into their consideration when directing others to share; however, it is unclear whether children's own hunger influences their actual allocation of resources and what children think constitutes fair behavior.

The current study measured children's self-reported hunger and examined whether hunger affected children's costly sharing behavior and fairness evaluations. We recruited children aged 4– 9 years because previous research has shown that this is a pivotal age range for children's developing concern with fairness (Kogut, 2012; Sigelman & Waitzman, 1991). Our primary interest was to determine whether hunger influenced children's decisions to share food and nonfood resources with another child in an anonymous dictator game (e.g., Benenson et al., 2007). We hypothesized that hungry children would be less likely to share both food and nonfood resources with a recipient in this game given findings from adult research suggesting

that deprivation can lead people to seek resources broadly, even beyond the domain in which they are experiencing scarcity (Sharma & Alter, 2012). However, we also thought that the effect of hunger might be more pronounced for food resources that could directly offset hunger.

In addition to assessing sharing behavior, we examined children's expectations and evaluations of others' sharing. Children were asked to predict how other children would share in the same game with both food and nonfood resources. Previous work has demonstrated a knowledge–behavior gap in children's sharing; young children expect that others will share as much as older children, but they themselves do not feel compelled to share (Smith et al., 2013). If hunger does reduce children's willingness to share their own resources, it might not influence their predictions of how others will share in the same games. Indeed, if hunger motivates resource acquisition, this might have different effects on children's own sharing and their evaluations of others. For example, hunger in adults reduces sharing in a dictator game while simultaneously increasing endorsement of welfare policies that encourage need-based equity and sharing in the long term (Aarøe & Petersen, 2013). Therefore, children may expect or want others to behave generously even when they fail to do so themselves. Investigating these questions in parallel will help to elucidate the role that situational factors have in shaping children's conceptions of fairness and determine how often children act in line with their fairness knowledge.

Finally, we asked children to evaluate others who had distributed resources between a hungry recipient and a full recipient in a distributive justice game. Children rated an equal distribution and an unequal distribution in which resources were allocated according to need-based equity favoring the hungry recipient. Although no previous research has examined children's evaluations of sharing based on hunger, children increasingly direct others to split

resources unequally in favor of hungry recipients with age (Schmidt et al., 2016). Therefore, we predicted that children would be more likely to view unequal sharing based on hunger as fairer than equal sharing, which ignored hunger, as they got older. Furthermore, we hypothesized that children who were hungrier would think that it was fairer to share more with the hungry recipient because they might identify more strongly with the recipient experiencing a similar need (Harel & Kogut, 2015).

Thus, we predicted that hunger would simultaneously make children less generous in their first-person sharing, because they would feel a sense of scarcity and keep more resources for themselves, while also making them think that it is more acceptable to share unequally in a way that benefits those who are hungry (e.g., adult findings in Petersen et al., 2014). In addition, we investigated the relationship between children's own sharing and expectations regarding how others will share to determine whether hunger affects children's expectations of fairness in others or merely their own behavior.

Importantly, we note that although we view hunger as one critical and fairly universal way in which to prime a sense of scarcity or need, it is certainly not the only way in which to do so. We view hunger as a means to induce a sense of scarcity and expect that if scarcity were primed in some other way, we would see similar results in this paradigm (for examples of non-hunger-based scarcity in adults, see Roux et al., 2015; Sharma & Alter, 2012).

1.1 Methods

Participants

Children aged 4–9 years were recruited from a database to participate in the study at a university in the midwestern United States. We aimed to recruit at least 30 children per age bin, and 204 children consented to the experiment (1 child was excluded due to inability to sit

through the tasks; N = 203; M_{age} = 6.89 years, SD_{age} = 1.74 years; 53% female; see Appendix E for more information about participant demographics). Experimental sessions took place in a testing room at the university between 11 a.m. and 2 p.m. in order to recruit a sample of participants with variability in the time since their last meal. Verbal assent and parental consent were obtained prior to testing. All study procedures were approved by the local institutional review board.

Procedure

First, an experimenter assessed perceived hunger and mood using child-friendly visual analog scales (1 = not at all hungry/very happy, 6 = very hungry/very sad). Children as young as 4 years have been shown to use visual analog scales to answer questions regarding satiety and hunger (Bennett & Blissett, 2014; K.L. Keller et al., 2006). Self-reported hunger was used to measure hunger because the experience of hunger can be quite subjective (e.g., Xu et al., 2015), particularly for people with regular access to food. In addition, work with adults often uses self-reported measures of deprivation as proxies for scarcity because even the perception of scarcity can have psychological consequences regardless of objective considerations (Roux et al., 2015).

Next, children learned the instructions for a child-friendly dictator game that was played twice. They were told that they could share some or all of their chosen resources with an anonymous child who would not get to play the game (age and gender matched to participants). Participants were given one envelope for resources to keep and one envelope for resources to share, and they privately distributed resources between the two envelopes while the experimenter turned away with closed eyes.

They played this game with one resource: either 10 stickers they chose as their favorite from an assortment or 10 food resources chosen from five snack options. Next, the experimenter

counted out 10 similar resources and explained that these resources would be given to another boy/girl (age and gender matched) coming into the lab later that day. This other child would play the same game as participants with these 10 resources. The experimenter asked participants how they thought the other child would distribute resources between himself or herself and an anonymous partner. Children made this prediction directly after the sharing game with the first resource and then repeated both the game and prediction with the second resource. The order in which resources were used in these tasks (stickers vs. food) was counterbalanced and randomized across participants.

Finally, the experimenter told children about two characters represented by cardboard stick figures. One was described as very hungry and looked skinny, and the other was described as very full and looked round. The experimenter told participants about two different distribution scenarios between these recipients. Children were asked to evaluate each distribution in terms of niceness (1 = very nice, 6 = not at all nice) and fairness (1 = very fair, 6 = not at all fair). In one scenario 10 food resources were equally divided between recipients, and in the other scenario the hungry recipient received 7 resources and the full recipient received 3 resources. The order in which these scenarios were presented was also randomized and counterbalanced across participants.

1.2 Results

A regression analysis was conducted to examine the association between self-reported hunger and mood to ensure that negative moods could not explain hunger effects. There was no significant correlation (r = .12, p = .102), and mood is not discussed further, although from this data point alone we cannot rule out the notion that relative deprivation exerted some of its impact based on mood.

A linear mixed-effects model was used to examine the influence of resource type and hunger on sharing decisions overall. A series of linear regressions was conducted to compare the impact of age and hunger on sharing decisions, predictions of resources shared by others, and evaluations in the distributive justice games. Age was treated as a continuous variable and was calculated using testing date and birthdate. Both age and hunger were z-scored before being entered as predictors in all models.

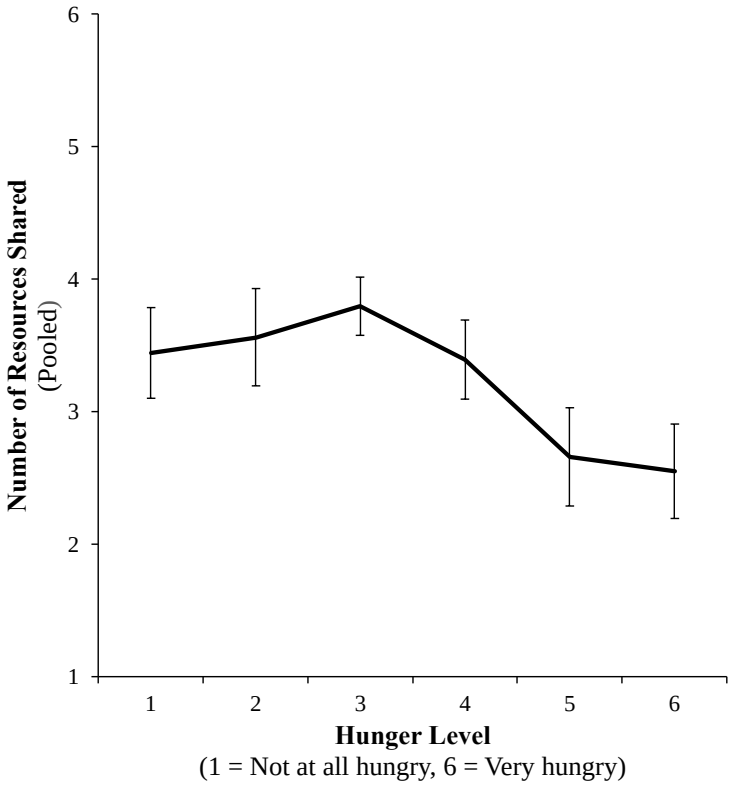
Dictator Game: Resources Shared

A linear mixed-effects model examining the impact of hunger and resource type on shared resources overall was conducted using the lme4 package in R (Bates et al., 2015). The participant variable was included as a random intercept in this model because every child made two sharing decisions. Results from this model provide evidence that hungrier children shared fewer resources overall (b = -0.46, p = .012; see Figure 1.1). The influence of resource was not significant in predicting sharing (b = -0.09, p = .637) and did not significantly interact with hunger (b = 0.26, p = .166; see Appendix A for full model output and Appendix D for descriptive statistics).

Separate linear regressions were conducted to examine the influence of hunger, age, and their interaction on the decision to share each resource. The effect of hunger was significant in predicting food resources shared (b = -0.48, p = .007) and directional for stickers (b = -0.22, p = .186). Consistent with prior work, children shared more stickers (b = 1.19, p < .001) and food (b = 0.64, p < .001) as they got older. The two-way interactions between age and hunger were not significant in either the stickers (b = -0.15, p = .350) or food models (b = -0.14, p = .425).

Figure 1.1

Children Share Less (Pooled) Resources as They Get Hungrier



Note: Error bars reflect the 95% confidence interval.

Predicted Resources Shared

Neither age (b = 0.07, p = .591) nor hunger (b = -0.04, p = .788), nor their interaction (b = -0.08, p = .518), significantly predicted the number of stickers children thought others would share. There was no significant main effect of age (b = 0.01, p = .951) or hunger (b = -0.01, p = .951) on predicted food resources shared. There was a significant two-way interaction between age and hunger in this model (b = -0.30, p = .023) (see Appendix C for the nature of this interaction). Children generally expected near equality from other children (stickers: $M_{predicted}$ = 4.32, $SD_{predicted}$ = 1.90; food: $M_{predicted}$ = 4.79, $SD_{predicted}$ = 1.95). Even younger children who kept more stickers (4-year-olds: M_{shared} = 1.55, $M_{predicted}$ = 4.70) and food (4-year-olds: $Mshared$ =

2.58, $M_{predicted}$ = 5.39) in the sharing task made this prediction for others (see Appendix D for descriptive statistics and asymmetry scores across ages).

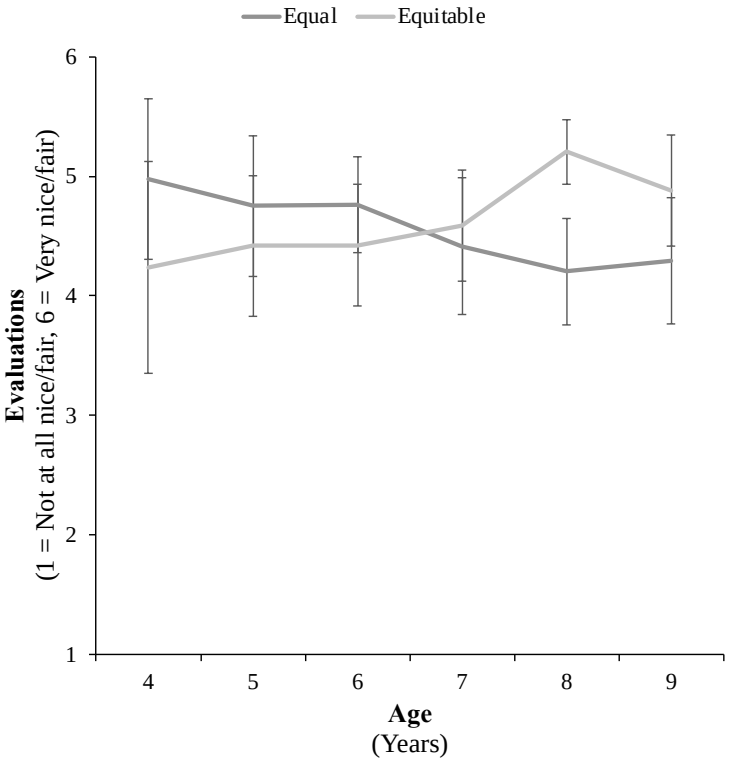
Distributive Justice Evaluations

Niceness and fairness scores were reverse-coded for ease of interpretation (1 = not at all nice/fair, 6 = very nice/fair) and were combined into composite variables due to high agreement (r = .70 for niceness and fairness in equality, r = .77 for niceness and fairness in equity). Sixteen children were unable to answer the evaluation questions due to an inability to understand the question about fairness, resulting in a total of 187 children for these analyses.

Age significantly influenced children's evaluations of equal resource distributions (b = -0.27, p = .017) and equitable resource distributions (b = 0.26, p = .025) between a hungry recipient and a full recipient. As children got older, they rated the equal distributions less positively and the equitable distributions (favoring the hungry) more positively (see Figure 1.2). These age-related evaluations are consistent with prior research examining how children direct others to share with a hungry recipient and a neutral recipient (Schmidt et al., 2016).
Hunger did not significantly influence fairness evaluations of equal distributions (b = 0.01, p = .956) or equitable distributions (b = -0.09, p = .406). The two-way interaction between age and hunger in the equality condition (b = -0.06, p = .595) and equity condition (b = -0.20, p = .067) were not significant.

Figure 1.2

Evaluations of Equal (Dark Grey) And Equitable (Light Grey) Resource Distributions Between a Hungry Recipient and a Full Recipient Across Ages



Note: Error bars reflect the 95% confidence interval.

1.3 Discussion

In line with our predictions, hunger impacted children's sharing behavior. Consistent with adult work (Xu et al., 2015), hungrier children were less likely to share both food and nonfood resources, and this effect was particularly pronounced when it came to sharing food. In addition, children became more generous with age. These results demonstrate that deprivation in the form of hunger influences sharing decisions across resource types and ages.

Despite the fact that hunger affected children's willingness to share resources, hunger did not change their expectations about how others would share, providing further evidence for a disconnect between children's sharing behavior and expectations about others' sharing (Blake et

al., 2014). Indeed, this disconnect suggests that hunger may lessen the desire to act fairly rather than changing normative expectations of how one should behave. That is, hunger may encourage competitive and self-maximizing behavior even if children understand that being fair might be the ‘‘right” thing to do (Shaw et al., 2012).

Counter to our prediction, we found that hunger did not influence children’s evaluation of distributors who divided resources unequally to favor a hungry recipient. Although we thought that hunger might promote identification with recipients experiencing hunger (Harel & Kogut, 2015) and might motivate a desire for equitable sharing earlier in development, age was more predictive of these evaluations than hunger. Older children viewed equitable distributions that favored the hungry recipient more positively compared with equal distributions; this was especially apparent between 8 and 9 years of age and did not vary based on hunger. In this age range, children are able to integrate recipient characteristics into their fairness considerations (Huppert et al., 2019; Rizzo & Killen, 2016) and increasingly direct others to share in accordance with these equity-based considerations (Schmidt et al., 2016). The younger children viewed the equal distributions more positively than the equitable distributions, consistent with research showing that younger children tend to equate fairness with equality rather than incorporating the need states of the recipients into their reasoning (Sigelman & Waitzman, 1991).

Although previous research has found that children distribute resources more equitably as they get older, the current work is one of very few experiments examining children’s evaluations of equal and equitable need-based allocations. Here we found similar age-related changes in children’s evaluations of third-party distributions as in their actual resource allocation decisions documented in previous literature (i.e., Huppert et al., 2019; Schmidt et al., 2016). Although we did not find a disconnect between the age-related pattern of evaluations in this study and

children's own sharing, there might be interesting cases in which evaluations and sharing are not aligned. For example, children may have self- serving biases, leading them to act unfairly even when they understand that it is unfair for others to engage in the same behavior. Future work should explore this possibility.

We did not observe an influence of hunger on children's evaluations of need-based sharing, but there are other situations in which deprivation may exert a stronger influence on evaluations. For example, hunger might influence children's sharing more dramatically if children were explicitly asked to adopt the perspective of the hungry recipient. It is unclear whether children were considering the perspective of the full or hungry recipient when evaluating these allocations. Future work could explore how different perspectives influence sharing.

These results open up exciting new avenues for research. Continuing to identify situations in which behavior and judgments diverge can help to quantify children's commitment to moral norms. Young children understand fairness as an important social principle and, therefore, encourage equal distributions in others, but they might not internalize this value deeply enough themselves to divide resources equally when hungry. Although hunger elevated the desire to gain resources over the desire to behave fairly in the current study, children may care more about upholding other moral principles, such as honesty and harm avoidance, even if doing so conflicts with self-maximizing behavior. Comparing children's own decision making with their evaluations of moral behaviors in others, particularly when faced with competing needs, is useful for examining the strength of children's commitment to these principles. Adults also experience deprivation and face similar trade-offs, and this work may help to inform the ways in which people balance competing desires to offset need and endorse moral norms. We do not

think that these effects are necessarily specific to hunger; people may demonstrate discrepancies between prosocial behaviors and judgments when experiencing other types of scarcity. Determining the ways in which children navigate these decisions can help to elucidate the mechanisms promoting prosocial decision making and moral conviction across the lifespan.

Although the current work is informative, it was limited in investigating only one form of scarcity— state hunger. Children experiencing chronic food insecurity may respond differently to acute hunger states compared with children from more affluent backgrounds. The current data cannot adequately address this question. It is also possible that our measure of state hunger was also tracking chronic hunger (but see Appendix E for a suggestion that poverty alone did not account for our effects) or that the timing of this question reminded children of their hunger prior to sharing. Future research should consider whether experiencing other types of scarcity has similar effects on prosocial behavior and should use more ecologically valid manipulations of hunger and varied resources in the sharing games.

Understanding the impact of childhood need, and perceived need, on sharing behavior and fairness preferences has implications for children's developing morality and even adult values. Although more work remains to understand the prosocial implications of experiencing hunger, the current results reveal that when faced with the decision of whether or not to share in the short term, children who feel hungry share less than their peers who do not.

1.4 Appendix A: Regression Coefficients and Output for Reported Models

Reported Model A: Pooled Shared Resources by Hunger and Resource Type

A linear-mixed effects model examining the influence of resource type, hunger level, and their interaction on overall resources shared, with Subject included as the random intercept, was conducted:

Code:

Pooled shared resources ~ hunger*resource + (1 | Subject)

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	3.3596	0.1823	18.432	< .001
Hunger	**-0.4641**	**0.1827**	**-2.540**	**.012**
Resource	-0.0887	0.1875	-0.473	.637
Hunger*Resource	0.2615	0.1880	1.391	.166

Note: The significant effects are bolded.

Reported Model B: Stickers Shared by Hunger and Age

A linear regression examining the influence of age, hunger, and their interaction on stickers shared was conducted:

Code:

Stickers shared ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	3.2702	0.1638	19.970	< .001
Hunger	-0.2208	0.1662	-1.328	.186
Age	**1.1878**	**0.1653**	**7.186**	**< .001**
Hunger*Age	-0.1494	0.1593	-0.937	.350

Note: The significant effects are bolded.

Reported Model C: Food Resources Shared by Hunger and Age

A linear regression examining the influence of age, hunger, and their interaction on food resources shared was conducted:

Code:

Food resources shared ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	3.3589	0.1750	19.194	< .001
Hunger	**-0.4830**	**0.1777**	**-2.719**	**.007**
Age	**0.6441**	**0.1767**	**3.646**	**< .001**
Hunger*Age	-0.1360	0.1703	-0.799	.425

Note: The significant effects are bolded.

Reported Model D: Number of Predicted Stickers That Another Child Will Share by Hunger and Age

A linear regression examining the influence of age, hunger, and their interaction on the number of stickers that the child predicted that another child would share was conducted:

Code:

Stickers predicted ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	4.3198	0.1338	32.286	< .001
Hunger	-0.0366	0.1358	-0.269	.788
Age	0.0726	0.1351	0.538	.591
Hunger*Age	-0.0844	0.1302	-0.648	.518

Reported Model E: Number of Predicted Food Resources That Another Child Will Share by Hunger and Age

A linear regression examining the influence of age, hunger, and their interaction on the number of food resources that the child predicted that another child would share was conducted:

Code:

Food resources predicted ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	4.7915	0.1358	35.286	< .001
Hunger	-0.0085	0.1379	-0.061	.951
Age	0.0084	0.1371	0.061	.951
Hunger*Age	**-0.3029**	**0.1321**	**-2.292**	**.023***

Note: The significant effects are bolded.

Reported Model F: Evaluation of Equal Distributions Between a Hungry and Full Recipient by Hunger and Age

Fairness and niceness scores from the third-party resource allocation evaluations were collapsed into a single composite evaluation measure.

A linear regression examining the influence of age, hunger, and their interaction on the evaluations of the equal distribution of resources was conducted:

Code:

Composite evaluation of equal distributions ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	4.5868	0.1079	42.492	< .001
Hunger	0.0060	0.1101	0.055	.956
Age	**-0.2715**	**0.1125**	**-2.414**	**.017 ***
Hunger*Age	-0.0582	0.1094	-0.532	.595

Note: The significant effects are bolded.

Reported Model G: Evaluation of Equitable Distributions Between a Hungry and Full Recipient by Hunger and Age

A linear regression examining the influence of age, hunger, and their interaction on the evaluations of the equitable distribution of resources (favoring the hungry) was conducted:

Code:

Composite evaluation of equitable distributions ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	4.6046	0.1095	42.036	< .001
Hunger	-0.0931	0.1118	-0.833	.406
Age	**0.2573**	**0.1141**	**2.254**	**.025**
Hunger*Age	-0.2048	0.1110	-1.845	.067

Note: The significant effects are bolded

1.5 Appendix B: Supplemental Model with Age

Supplemental Model A: Pooled Shared Resources by Hunger and Resource Type, Controlling for Age

We conducted the pooled shared resources linear mixed-effects model (Reported Model A) with age added as a covariate. Results were robust to this control:

Code:

Pooled shared resources ~ hunger*resource + Age + (1 | Subject)

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	3.3596	0.1703	19.725	< .001
Hunger	**-0.4592**	**0.1707**	**-2.689**	**.008 ***
Resource	-0.0887	0.1875	-0.473	.637
Age	**0.9334**	**0.1426**	**6.548**	**< .001**
Hunger*Resource	0.2615	0.1880	1.391	.167

Note: The significant effects are bolded.

As evidenced, there is still a main effect of hunger (b = -0.46, p = .008) when controlling for age, as well as a main effect of age (b = -0.93, p < .001). Resource type and the interaction between resource and hunger remain insignificant (ps > .17).

1.6 Appendix C: Exploratory Analysis on Asymmetry Scores

Linear regressions were conducted examining the influence of age, hunger, and their interaction on asymmetry scores by resource type. Age and hunger were z-scored before being entered into these models. The asymmetry scores were derived from subtracting the amount of resources a child shared from the predicted amount of resources that the child thought that another child would share (i.e., stickers predicted – stickers shared). Exploratory Model B was included to help unpack the nature of the significant two-way interaction of hunger and age on predicted food resources shared.

Exploratory Model A: Asymmetry Between Stickers Shared and Predicted by Hunger and Age

Code:

Asymmetry score (stickers) ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	1.0496	0.1826	5.747	< .001
Hunger	0.1842	0.1854	0.994	.322
Age	**-1.1152**	**0.1844**	**-6.049**	**< .001**
Hunger*Age	0.0650	0.1777	0.366	.715

Note: The significant effects are bolded.

As children get older, there is less asymmetry between the number of stickers that they predict another child will share and the number of stickers they actually share. In other words, children share more equally, similarly to their predictions, with age. The main effect of hunger and the interaction effect between hunger and age do not influence asymmetry scores.

Exploratory Model B: Asymmetry Between Food Resources Shared and Predicted by Hunger and Age

Code:

Asymmetry score (food resources) ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	1.4326	0.1735	8.258	< .001
Hunger	**0.4745**	**0.1761**	**2.694**	**.008***
Age	**-0.6357**	**0.1751**	**-3.630**	**< .001**
Hunger*Age	-0.1668	0.1688	-0.988	.324

Note: The significant effects are bolded.

Again, as children get older, there is less asymmetry in the number of food resources that they predict another child will share and the number of food resources that they actually share because they share more equally. As children get hungrier, there is more asymmetry in the number of food resources that they predict another child will share and the number of food resources they actually share. Hungrier children share less resources but still expect equality. The interaction effect between hunger and age does not significantly impact asymmetry scores.

1.7 Appendix D: Descriptive Statistics

Table S1.1

Means (and Standard Deviations) of Resources Shared, Predicted Resources Shared, and Asymmetry Scores (Predicted – Shared) Across Age for Stickers

	Age					
	4	5	6	7	8	9
Actual Stickers Shared	1.55 (2.65)	2.13 (2.12)	2.87 (2.24)	4.14 (2.49)	4.52 (2.28)	4.86 (2.40)
Predicted Stickers Shared	4.70 (2.92)	3.75 (1.90)	3.98 (2.16)	4.59 (1.15)	4.73 (0.80)	4.34 (1.20)
Asymmetry Score Stickers	3.15 (3.00)	1.63 (2.52)	1.11 (2.72)	0.45 (2.46)	0.21 (2.47)	-0.52 (2.37)

Note: Children had 10 total resources to distribute.

Table S1.2

Means (and Standard Deviations) of Resources Shared, Predicted Resources Shared, and Asymmetry Scores (Predicted – Shared) Across Age for Food Resources

	Age					
	4	5	6	7	8	9
Actual Food Shared	2.58 (3.48)	2.63 (2.11)	3.04 (2.14)	3.52 (2.43)	4.00 (2.29)	4.69 (2.65)
Predicted Food Shared	5.39 (2.66)	4.44 (2.15)	4.36 (1.97)	4.41 (1.52)	5.03 (1.16)	5.31 (1.58)
Asymmetry Score Food	2.82 (3.07)	1.81 (2.66)	1.32 (2.39)	0.90 (2.51)	1.03 (2.07)	0.62 (2.34)

Note: Children had 10 total resources to distribute.

Table S1.3

Means (and Standard Deviations) of Resources Shared, Predicted Resources Shared, and Asymmetry Scores (Predicted – Shared) by Hunger Level for Stickers

	Hunger level					
	1	2	3	4	5	6
Actual Stickers Shared	3.00 (2.59)	3.42 (2.81)	4.16 (2.26)	2.98 (2.85)	3.05 (2.61)	2.60 (2.58)
Predicted Stickers Shared	4.19 (2.21)	4.38 (1.31)	4.41 (1.44)	4.60 (1.75)	3.82 (2.65)	4.27 (2.13)
Asymmetry Score Stickers	1.19 (2.80)	0.96 (2.58)	0.24 (2.73)	1.62 (3.19)	0.77 (3.13)	1.67 (2.22)

Note: Hunger level is a 6-point scale: (1 = not at all hungry, 6 = very hungry).

Table S1.4

Means (and Standard Deviations) of Resources Shared, Predicted Resources Shared, and Asymmetry Scores (Predicted – Shared) by Hunger Level for Food Resources

	Hunger level					
	1	2	3	4	5	6
Actual Food Shared	3.89 (3.15)	3.71 (2.27)	3.43 (2.02)	3.81 (2.61)	2.27 (2.25)	2.50 (2.97)
Predicted Food Shared	4.75 (2.36)	4.96 (1.76)	4.51 (1.19)	5.14 (1.51)	4.36 (2.36)	5.00 (2.67)
Asymmetry Score Food	0.86 (2.70)	1.25 (2.75)	1.08 (2.09)	1.33 (2.76)	2.09 (2.78)	2.50 (2.46)

Note: Hunger level is a 6-point scale: (1 = not at all hungry, 6 = very hungry).

1.8 Appendix E: Additional Information Regarding Participant Sample

Children were recruited in the Chicago area to participate in testing sessions between the hours of 11:00am and 2:00pm to try to test children right before or right after eating lunch and allow for a range of naturally occurring hunger levels. We recognize that testing in the laboratory limits the ability to control or monitor food intake of the participants, but research assistants were very explicit about the purpose of the experiment timing and goals of the study when talking to the parents on the phone prior to recruitment (parents who had opted-in to a database at the university were contacted to bring in their children as participants). Families scheduled to arrive between 11:00 am-12:15pm were asked if their children could wait to eat lunch until after the experiment; families arriving after 12:30pm were asked if their children could eat ahead of time.

Despite this rigorous recruitment strategy, we could not make children eat lunch (or wait to eat lunch) exactly as we planned, and therefore, self-reported hunger ended up being a more appropriate measure of the hunger manipulation.

204 of the recruited families consented to the study overall, though 1 child was excluded from the entire data analysis sample due to inability to sit still and answer the questions. We had aimed to recruit at least 30 children/age bin and we were very close to achieving this goal. Please see below (Table S1.5) for a breakdown of the sample size by age bin.

Table S1.5

Age Distribution of Final Sample

	Age					
	4	5	6	7	8	9
N by Age Bin	33	32	47	29	33	29
Total *N*						203

Additional Information on Income:

203 children successfully completed the sharing tasks and information on the gender and age breakdown of this sample is reported in the main text. In addition to gender and age, we also collected demographic information regarding income. Income was assessed using the following 10-point scale, though the seven families who responded with 10 = "Prefer not to answer" were excluded from analysis:

1 = Less than $25,000
2 = $25,000 - $49,999
3 = $50,000 - $74,999
4 = $75,000 - $99,999
5 = $100,000 - $124,999
6 = $125,000 - $149,999
7 = $150,000 - $174,999
8 = $175,000 - $199,999
9 = $200,000 or more
10 = Prefer not to answer

We conducted models controlling for income in an initial wave of data collection (N = 168) and results were robust to this control. Therefore, the remaining sample did not involve parent participation and we did not collect this measure. We combined data from Waves 1 and 2 of data collection to form the final data set, but only used measures collected in both Waves for the final analysis, and thus, income was not included. Wave 1 and Wave 2 of data collection occurred rather close together, but there was a brief interruption between Waves of data collection that resulted from a natural pause in both the research assistants and participating families' schedules between summer vacation and fall sessions.

In the initial sample of 168 families, the average income score (after removing seven responses of "prefer not to answer") was 4.86 (*SD* = 2.76), suggesting that the average income

was between the $75,000-$99,999 and $100,000-$124,9999 income brackets. The number of families in our sample reporting each income bracket is listed below in Table S1.6.

Table S1.6

Number of Children by Income Bracket in Initial Sample

	Income Level									
	1 Less than $25,000	2 $25,000 - $49,999	3 $50,000 - $74,999	4 $75,000 - $99,999	5 $100,000 - $124,999	6 $125,000 - $149,999	7 $150,000 - $174,999	8 $175,000- $199,999	9 $200,000 or more	10
Number of children	15	29	23	17	18	17	15	3	24	7

Note: Income brackets 1-9 were included for analysis and choice option 10 (prefer not to answer) was excluded from analysis.

Although including income brackets as a control is also an imperfect measure of chronic poverty (and of food insecurity), we conducted the linear regressions examining the effect of hunger, age, and their interaction, on shared stickers and shared snacks with and without this covariate in an original wave of data collection ($N = 161$ after "prefer not to answer" responses removed) and found that our results were robust to this control (see model output below). Therefore, we continued a second wave of data collection without asking for parent participation (and did not collect income).

Supplemental Model B: Stickers Shared by Hunger and Age in Wave 1

The same linear regression from Reported Model B, examining the effect of hunger, age, and hunger*age on stickers shared, was conducted with just the Wave 1 sample:

Code:

Stickers shared ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	3.3217	0.1885	17.620	< .001
Hunger	-0.0643	0.1924	-0.334	.739
Age	**1.1836**	**0.1899**	**6.231**	**< .001***
Hunger*Age	-0.2513	0.1859	-1.352	.178

Note: The significant effects are bolded.

Supplemental Model C: Stickers Shared by Hunger and Age Controlling for Income

A linear regression examining the effect of hunger, age, hunger*age and income on stickers shared was conducted in the Wave 1 sample:

Code:

Stickers shared ~ hunger*age + Income

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	2.7324	0.3897	7.012	< .001
Hunger	-0.1146	0.1934	-0.593	.554
Age	**1.1652**	**0.1891**	**6.164**	**< .001***
Income	0.1272	0.0737	1.725	.087
Hunger*Age	-0.2285	0.1852	-1.234	.219

Notes: The significant effects are bolded. Hunger and Age were numeric variables that were z-scored prior to being entered into the models, as in the models without income. All scores of "10" ("prefer not to answer") were removed from the Income variable prior to analysis, resulting in $N = 161$.

As evidenced, adding income to the model did not change the direction of the effects on stickers shared. Age was significant in both Model 1 ($b = 1.18$, $p < .001$) and Model 2 ($b = 1.17$, $p < .001$), as in the reported model in the manuscript from the final sample, and the other effects were not significant in either model.

Supplemental Model D: Food Resources Shared by Hunger and Age in Wave 1

The same linear regression from Reported Model C, examining the effect of hunger, age, and hunger*age on food resources shared, was conducted with just the Wave 1 sample:

Code:

Food resources shared ~ hunger*age

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	3.4324	0.2048	16.757	< .001
Hunger	-0.3896	0.2090	-1.864	.064
Age	**0.5313**	**0.2064**	**2.574**	**.011***
Hunger*Age	-0.0810	0.2019	-0.401	.689

Note: The significant effects are bolded.

Supplemental Model E: Food Resources Shared by Hunger and Age Controlling for Income

A linear regression examining the effect of hunger, age, hunger*age and income on food resources shared was conducted in the Wave 1 sample:

Code:

Food resources shared ~ hunger*age + Income

Fixed Effects:

	Estimate	SE	*t*	*p*
Intercept	3.3723	0.4274	7.891	< .001
Hunger	-0.3947	0.2121	-1.861	.065
Age	**0.5294**	**0.2073**	**2.553**	**.012**
Income	0.0130	0.0809	0.160	.873
Hunger*Age	-0.0787	0.2031	-0.388	.699

Notes: The significant effects are bolded. Hunger and Age were numeric variables that were z-scored prior to being entered into the models, as in the models without income. All scores of "10" ("prefer not to answer") were removed from the Income variable prior to analysis, resulting in $N = 161$.

As evidenced, adding income to the model did not change the direction of the effects. Age was significant in both Model 3 ($b = 0.53$, $p = .011$) and Model 4 ($b = 0.53$, $p = .012$), as in the reported model in the manuscript from the final sample. The effect of hunger was trending in both Model 3 ($b = -0.39$, $p = .064$) and Model 4 ($b = -0.39$, $p = .065$) in the same direction. The

trend of hunger in these initial models is also in the same direction as the significant effect reported in the main model in the manuscript (b = -0.48, p = .007). Since our primary research question concerned the effect of hunger on food resources, we compared these two models using food resources as the dependent variable (rather than models using sticker resources) using Akaike information criterion (AIC) scores. The model without income had a lower AIC score ($AIC_{model\ one}$ = 770.27, $AIC_{model\ two}$ = 772.24). Given that adding income did not change the effect of hunger or age in these models, or provide a significantly better fit for the data, and that chronic poverty/food insecurity were not the focus of this research, we did not involve parents in the remaining phase of data collection (which also saved time and resources).

Additional Information on Self-Reported Hunger:

The distribution of self-reported hunger across our sample by age is reported in Table 1.7.

Table S1.7

Number of Children Reporting Each Hunger Level by Age

		Hunger Level						*Total Children by Age*	*Mean Hunger Level*
		1	2	3	4	5	6		
Age	**4**	10	2	3	8	3	7	**33**	**3.39**
	5	8	4	7	4	5	4	**32**	**3.19**
	6	4	7	14	11	4	7	**47**	**3.53**
	7	5	1	4	9	6	4	**29**	**3.76**
	8	4	4	15	4	1	5	**33**	**3.27**
	9	5	6	6	6	3	3	**29**	**3.17**

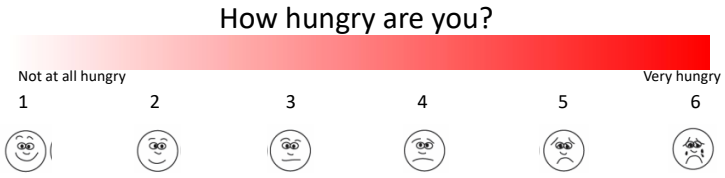
Note: Hunger level is a 6-point scale: (1 = not at all hungry, 6 = very hungry).

1.9 Appendix F: Study Materials

The scales used for self-reported hunger, self-reported mood, fairness evaluations, and niceness evaluations are provided below (note: the fairness and niceness evaluations of the third-party distributions were ultimately combined into a single preference composite measure and reverse-coded).

Self-reported hunger:

State Hunger Scale



Self-reported mood:

Mood & Affective State Scale

_____ *(1=very happy, 6=very sad)*

Niceness evaluation (reverse-coded for analysis, see Results section):

Evaluation: niceness

_____ *(1=very nice, 6=not at all nice)*

How nice was the other child's decision?

Fairness evaluation (reverse-coded for analysis, see Results section):

Evaluation: fairness

_____ *(1=very fair, 6=not at all fair)*

How fair was the other child's decision?

Script for the Initial Hunger and Mood Questions:

Experimenter reads: "For our first game, I would like you to show me how hungry you are right now using these smiley faces. Are you really hungry or not at all hungry?" *The experimenter naturally explains how the scale works and what the faces indicate before assessing hunger level. Use the binary option and slowly nudge further (are you hungry? Yes: are you just a little hungry, medium hungry, or very hungry? Medium: medium but a little more hungry than not? etc.).* "Can you show me using the smiley faces how hungry you are?"

"Great job! Thank you for showing me how hungry you are!"

Present mood scale. *You may need to re-explain how the scale works and practice with the children before asking their affective state at this moment. Again, if the child just does not understand how to use the 6-point smiley/frowning face scale, you may instead ask a binary question ("Are you very happy or very sad?") and try coaxing out more from there or just record a 1 or a 6, if necessary.*

"Now, for this game, I want you to point to the face that most fits how you're feeling right now. *Student-tester points to happiest face.* This face means you are very happy. *Student-tester to point to sad face.* This face means you are very sad. You can be anywhere in between! Can you show me which face looks like how you feel?"

Dictator Game Script:

Counterbalance order of trials (stickers v. fruit snacks/goldfish/raisins).

Experimenter reads: "Now we are going to play a game with some stickers [snacks]!"

If playing the sticker trial, "Will you please pick out 10 stickers you really like?" *Empty bag of around 50 stickers and allow child to select 10 stickers that he/she really likes for the game.*

If playing with fruit snacks/goldfish/raisins, place 10 fruit snacks/goldfish/raisins in front of child (note: child picks type of snack at start of session with parent present to confirm no allergies, but student-tester counts out 10 of the chosen snacks from snack bag).

Experimenter: "Great! These are <u>your</u> stickers [*snacks*] for you to keep**.** *Put 10 stickers/ fruit snacks/goldfish/raisins in a row in front of the child*. Do you like your stickers [snacks]? *Wait for child to affirm.* Great! Now we are ready to play the game!"

Experimenter: "I don't have enough time to play games today with every girl/boy who wanted to come into our lab today. I only have time to play games with one more boy/girl after you today. In this game, you get to decide how many of your stickers [fruit snacks/goldfish/raisins] you want to keep, and how many of your stickers [fruit snacks/goldfish/raisins] you want to give to another little girl/boy who will not get to come play games today. You do not have to give any of your stickers [fruit snacks/goldfish/raisins] away, but if you want to give some or all of your stickers [fruit snacks/goldfish/raisins] away, you can."

Experimenter: "You do not have to give away any of your stickers [snacks]. It is your choice. You can do whatever you want, it is up to you. I will not know if you choose to give any stickers [fruit snacks/goldfish/raisins] away. You can take home as many stickers [fruit snacks/goldfish/raisins] as you want."

"Any stickers [fruit snacks/goldfish/raisins] you are going to keep, you will put them in your envelope here *(point to the envelope or the box with the child's name written on it next to the child).* This is your envelope!"

"Any stickers [fruit snacks/goldfish/raisins] you want to give away, you can put in this envelope *(point to blank envelope for other girl/boy).* This envelope will go into that big pile of envelopes. *Point to a pile of similar white envelopes near the child.* Another person from our lab will come

and take these envelopes away and share any stickers [or fruit snacks/goldfish/raisins] that are in those envelopes at the end of the day with a little girl/boy who did not get to come into the lab to play games today. If you decide to give some stickers [fruit snacks/goldfish/raisins] away, I will not know the boy/girl who gets them and you won't know either. The other lady who comes to take the envelopes away won't know which envelope is yours or if you chose to give any stickers [fruit snacks/goldfish/raisins] away. Do you have any questions?"

Verify: "Can you show me which envelope is your envelope? *(wait for child to point to correct envelope* That's right, this is your envelope *(point to envelope with child's name)*. You take home the stickers [fruit snacks/goldfish/raisins] in this envelope.

Can you show me which envelope is for another girl/boy*? (wait for child to point to correct envelope).*

That's right, this is the envelope for that girl/boy *(point to the blank envelope).* This envelope will go into that pile (point to that pile) and another lady will give these stickers [fruit snacks/goldfish/raisins] to those boys/girls who do not get to come into the lab today. No one will know if you choose to give any stickers [fruit snacks/goldfish/raisins] away."

Experimenter: "Now we are ready to play! I'm going to cover my eyes now while you decide how many stickers [fruit snacks/goldfish/raisins] you want to keep and how many you want to give away if you want too *(Close and cover eyes and turn away from table to give child privacy to make their choice).* You can tell me when you are finished choosing."

Once child has finished choosing:

Experimenter: "Great job!! These are your stickers [fruit snacks/goldfish/raisins]. *(point to child's own envelope).* You get to take these stickers [snacks] home. "

Another student-tester: *Comes to take envelopes away and record amount given.*

"Thank you so much for playing with me today!"

Other Child Predictions Script:

The "other" prediction measure follows sharing with one resource (i.e., stickers sharing, stickers prediction) prior to moving onto the second resource. Take out paper plates and keep out the resources.

Experimenter reads: "When we are done playing today, another boy/girl is coming into our lab to play a game with us. He/she is the last child I have time to play with today. I will also ask the other boy/girl who comes in after you today if he/she wants to share any of his stickers/ fruit snacks/goldfish/raisins with children who did not get to come into our lab to play games today *[match age, gender]*. "

Experimenter lays out an additional 10 resources (matching the resource used in the sharing trial in terms of stickers or food).

Experimenter asks: "Do you think the other little girl/boy who comes in to play games after you will share stickers [fruit snacks/goldfish/raisins] with another boy/girl who I won't have time to play with today? If these are the other child's stickers/snacks *(point to resources),* can you show me how many you think the other child will keep and how many the other child will share?"

Experimenter instructs participant to put any or all resources the participant thinks that the other child will keep on one paper plate and any or all resources the participant thinks that the other child share on a second paper plate.

Repeat dictator game and other prediction with second resource (snacks or stickers).

Script For The Distributive Justice Evaluations:

Take out full and hungry stick figures and fairness and niceness scales. Use whichever food resource the child used (fruit snacks, goldfish, or raisins) for this measure.

Experimenter says: "Now, I am going to tell you about some other children (*gender match, age match*) who came to play games with me already earlier today. We played a different game. Those children got fruit snacks/goldfish/raisins, but they had to share these snacks. They could not keep any of their fruit snacks/goldfish/raisins like you could. They had to choose how to share their fruit snacks/goldfish/raisins with this little boy/girl *(match gender, age, present hungry stick figure)* or this little boy/girl *(again match, present full stick figure).* They could give them all to this other child *(point to skinny stick figure)* or this other child *(point to full stick figure)* or split up the fruit snacks/goldfish/raisins between both other children! This little boy/girl is very hungry and did not eat breakfast today *(point to skinny stick figure).* This little boy/girl is very full and just had a big breakfast *(point to round stick figure)."*

Randomize/counterbalance the order of equity v. equality decisions.

Equality: *Take out relevant food resource and split equally (five v. five). Present fairness and niceness scales again.* "The first/second *(depending on counterbalanced order)* girl/boy I played with today gave 5 fruit snacks/goldfish/raisins to this full child (*carefully count out and place 5 snacks in front of the full stick figure)* and 5 fruit snacks/goldfish/raisins to this hungry child *(carefully count out and place 5 snacks in front of the hungry figure)"*

"Do you think that was fair or not fair?" *(go through same binary to Likert-type scale questioning using the smiley-face scale to get a fairness rating).*

Do you think that was nice or mean?" *(go through same binary to Likert-type scale questioning using the smiley-face scale to get a niceness rating).*

"The first/second child *(depending on counterbalanced order)* I played with today, before you came in, gave 7 fruit snacks/goldfish/raisins to this hungry little boy/girl *(point to hungry stick figure and carefully count out and place 7 snacks in front of the figure).* He/she gave 3 to this other full little girl/boy *(point to full stick figure and count out 5 fruit snacks/goldfish/raisins to place in front of this figure).*"

"Do you think that was fair or not fair?" *(go through same binary to Likert-type scale questioning using the smiley-face scale to get a fairness rating).*

Do you think that was nice or mean?" *(go through same binary to Likert-type scale questioning using the smiley-face scale to get a niceness rating).*

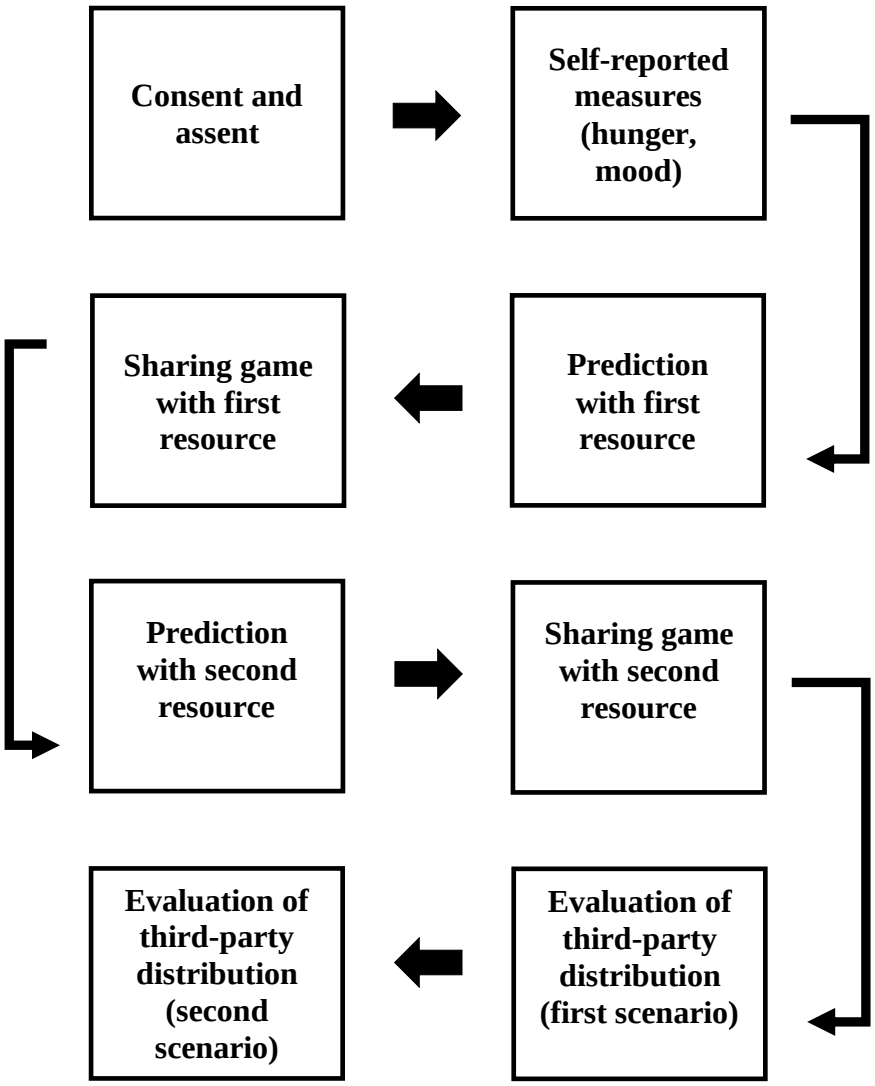
After the second round at the end of the game, **experimenter reads:** "Great job, thank you!

1.10 Appendix G: Flow Chart of Study Design

When children first arrived at the testing room, parental consent and verbal assent were obtained. The type of snack resource was also chosen at this time. Parents were then taken to a separate room to wait while their child participated in the study. The child and experimenter brought both resource types to a table that had the other study materials (scales, envelopes for the sharing games, paper plates for the "other" prediction task, etc.). First, the experimenter assessed hunger and mood. Then, the dictator games and prediction tasks were started. Children picked out the stickers before playing the dictator game and the order of the sharing and prediction tasks were counterbalanced and randomized across participants. The evaluation scenarios (equal or equitable distributions of resources between the hungry and full recipient) followed the dictator games/predictions, the order of which was also counterbalanced and randomized across participants. After the last measure (second scenario of the third-party evaluation), children were thanked for their time and given prizes for their participation, which were the resources they chose to "keep" in the dictator games and one small additional prize. Parents were also thanked and compensated for their time and travel.

Figure S1.1

The Flow of the Experiment During Each Study Session



CHAPTER 2: THE DEVELOPMENT OF CHILDREN'S PREFERENCES FOR EQUALITY AND EQUITY ACROSS 13 INDIVIDUALISTIC AND COLLECTIVIST CULTURES[2]

Fairness is an essential component of large-scale, coordinated cooperation (Dawes et al., 2007). A concern with fairness may have evolved as an effective strategy in mutualistic situations, since a fair division of resources can help promote cooperation and sustain social systems (Baumard et al., 2013; Decety & Yoder, 2017). Fair resource distributions tend to increase group functioning, and consequently, benefit individuals within the group (Deutsch, 1975). Consistent with this perspective, people react negatively to violations of unfairness and consider evidence of past fairness to be a sign of a good social partner (Shaw et al., 2012). Even children are motivated to behave fairly; however, conceptions of fairness change with age in childhood (McAuliffe et al., 2017a).

A motivation for equality is present at a young age. Children expect fairness from others (Dunfield et al., 2013), and reflect this expectation in their own behaviors by 15 months of age (Schmidt & Sommerville, 2011). By age 3, children endorse norms of equality in third-party resource allocation tasks where they do not stand to gain in resources (Smith et al., 2013). When asked to distribute resources between two anonymous recipients in a distributive justice game, young children prefer equal distributions when no other information about the recipients is available (Malti et al., 2016). Even when recipients are described as contributing differently to a joint task, young children prefer equality in distributions, in which both partners receive the same amount of resources, compared to equity in distributions, in which recipients are given more

[2] A version of Chapter 2 has been published as: Huppert, E., Cowell, J. M., Cheng, Y., Contreras-Ibáñez, C., Gomez-Sicard, N., Gonzalez-Gadea, M. L., ... & Decety, J. (2019). The development of children's preferences for equality and equity across 13 individualistic and collectivist cultures. *Developmental Science*, *22*(2), e12729.

resources when they contribute more effort (Baumard et al., 2012). In situations where children cannot distribute equally, some will even throw away extra resources to avoid uneven distributions (Shaw & Olson, 2012). Equality appears to be synonymous with fairness in early childhood.

As children age, they integrate social norms into more nuanced conceptions of fairness. Even preschool-aged children have been shown to consider merit contributions in resource allocation decisions (Kanngiesser & Warneken, 2012), and by age 6, children take factors beyond equality in their determinations of fairness, such as deservingness (Almås et al., 2010; Damon, 1977). Equity refers to such distributions based on deservingness rather than equality, which favors identical allocations. Older children reward recipients who contribute more work towards a joint goal (Kienbaum & Wilkening, 2009). Emotional and material need also impacts older children's sharing behaviors, resulting in a tendency to allocate more resources to disadvantaged recipients (Chernyak & Kushnir, 2013; Paulus, 2014). In a variant of the distributive justice game, children give more toys to recipients characterized with cues of low-wealth, such as smaller homes, compared to cues of high wealth (Shutts et al., 2016). Children also favor recipients who have previously shared with others (House et al., 2013) or who have similar in-group status (Benozio & Diesendruck, 2015). In situations of inequality between two recipients, 7–8-year-old children judged equal distributions less positively than equitable distributions (Rizzo & Killen, 2016). Manipulating the characteristics of recipients in distributive justice games makes it possible to identify children's understanding of fairness and how their understanding shifts throughout childhood and adolescence.

Despite these well-established age-related changes in children's resource allocation preferences, differences in fairness cognitions persist across cultures. For instance, children from

smaller scale, traditional communities within Fiji and Peru demonstrate a concern with fairness at an earlier age than children from more industrialized, urban environments in the United States, China, and Brazil (Rochat et al., 2009). In a dictator game across five cultures, older children shared more resources than younger children overall. However, this egalitarian preference emerged at an earlier age in children from the United States, Canada, and China compared to children from South Africa and Turkey (Cowell et al., 2017). Culture-related differences also appear in children's spontaneous sharing decisions. Asian children have been shown to spontaneously share resources more frequently than American children, and Chinese children spontaneously share more resources than Indian children (Rao & Stewart, 1999). Examinations of inequity preferences in seven societies find that children develop a preference for disadvantageous inequity aversion similarly in each society, but endorsement of advantageous inequity aversion varies by culture (Blake et al., 2015a). Cross-national differences in resource allocation decisions suggest that socialization contributes to the development of prosocial behavior.

Although children may possess a relatively universal capacity to develop a concern with fairness, cultural norms influence specific manifestations of fairness (Almås et al., 2010). For example, most people are concerned with the welfare of others, yet perceptions of harm and caring differ between societies (Miller, 2006). More time in communal activities and living with extended family may foster group-based ideals of fairness whereas urban, individualistic societies often promote competition and assertiveness (Rochat et al., 2009). American children exhibit more self-maximizing behavior in resource allocation tasks in comparison to Samoan children, possibly because of a greater emphasis on private space and individual possession in American culture compared to pervasive communal and public properties in Samoan culture

(Robbins & Rochat, 2011). Work with children and adults from six societies found similarities in early fairness origins, but preferences started to diverge in middle childhood as children integrated cultural-specific norms (House et al., 2013). These cultural-specific norms are often taught through parenting, school education, and social institutions (Cappelen et al., 2017).

Diversity in social environments provides unique opportunities for learning with implications for children's social cognitive development (Vredenburgh et al., 2017). Cultural values taught in the home, school, and society interact with children's dispositions to shape social preferences. For instance, parental levels of empathetic concern and justice sensitivity have been shown to predict infants' third-party social evaluations at the brain level (Cowell & Decety, 2015), and societal differences in market integration impact decision-making in ultimatum games (Henrich et al., 2005). In line with these findings, culture affects the development of many cognitive abilities associated with prosocial development, such as executive functioning (Imada et al., 2013; Lan et al., 2011) and theory of mind (Cowell et al., 2017; Sabbagh et al., 2006). Cultural values transmitted in the social environment interact with individual differences in genetic traits to inform fairness cognitions (Knafo-Noam et al., 2018).

A country's level of individualism or collectivism is another factor that can influence fairness preferences. Individualism versus collectivism (I/C) refers to the integration of individuals within group categories (Hofstede, 2001). Differing I/C levels can impact group-related values and determinations of social appropriateness (Cialdini et al., 1999). People from more collectivist cultures emphasize integrated family structures, viewing themselves as parts of a whole, while people from individualistic cultures generally prioritize personal goals and autonomy (Triandis, 2001). The collectivist focus on interdependence may have developed in response to ecological conditions favoring pastoral farming and obedience in agricultural

systems, whereas individualistic cultures may have developed to promote success in hunting and gathering societies where independence and achievement were instrumental in food acquisition (Berry, 1971; Greenfield et al., 2003). These differences may translate into unique fairness preferences. Children from individualistic cultures that encourage independent work ethic in competitive atmospheres may see resource allocation as dependent on effort and as a reward for hard labor (Sigelman & Waitzman, 1991). Alternatively, children from collectivist cultures may prefer equality to equity because of larger social support networks that provide security in times of need. Fittingly, children from small-scale societies with more group-oriented values were found to distribute resources fairly to a greater extent than children from more individualistic societies (Rochat et al., 2009). Children from collectivist Uganda also engage in less inequity aversion than American children (Paulus, 2015). The I/C differences between countries may result in disparate preferences for equity versus equality.

Not only are differing I/C levels likely to impact the use of equality or equity-based distribution strategies, but also the perceived acceptability of nonequal distributions. The decision to distribute resources equitably requires justification to depart from equality (Schmidt et al., 2016), which can vary by culture. Prior work suggests that cultural affiliation influences the decision to differentially distribute resources based on merit and need. For instance, participants from Hong Kong rated unequal distributions between recipients differing in merit as more fair than unequal distributions between recipients differing in need, whereas the reverse was true for participants from Indonesia (Murphy-Berman & Berman, 2002). Hong Kong is a more individualistic culture than Indonesia and I/C levels predicted different judgments of unequal resource allocations between two hypothetical recipients. Need was a more compelling justification for inequality in a more collectivist culture, and similarly, participants from India

and Indonesia both favor need-based inequity to a greater extent than participants from the United States (Murphy-Berman et al., 1984). Likewise, participants from two individualistic cultures, the United States and Norway, viewed inequality produced by luck as less acceptable than inequality resulting from merit; however, participants from the United States, which is ranked higher on the individualistic spectrum than Norway (Hofstede & Hofstede, 1991), were more accepting of inequalities than participants from Norway overall (Almås et al., 2016). I/C levels within a country thus appear to influence permissibility of unequal outcomes. As children integrate an individualistic or collectivistic mindset into their fairness cognitions, resource allocation preferences may differ across cultures.

In addition to influencing fairness considerations, culture may also affect the age at which children shift from equality to equity-based distribution strategies. Younger children are likely to favor equal distributions in third-party distributive justice games because they understand equality as a basic rule regarding fairness (Malti et al., 2016; Smith et al., 2013). Throughout development, children learn to integrate contextual cues into their determinations of fairness (Meidenbauer et al., 2016; Santamaría-García et al., 2018), become more sensitive to societal norms (House et al., 2013), and are likely to exhibit more equity-based strategies. In support of this developmental trajectory, 5-year-old children, but not 3-year-olds, distribute resources unequally in favor of a needy recipient (Paulus, 2014). Likewise, 5-year-old children favor a needy and a hardworking puppet over a neutral puppet in distributive justice games, while 3-year-olds still prefer equality, and 8-year-olds exhibit this equity-based preference to a greater degree than 5-year-olds (Schmidt et al., 2016). Throughout development, children gain a more flexible understanding of fairness through internalization of social norms and cultural learning. While this developmental trend is hypothesized to be universal, cultural grouping may impact the

magnitude of these preferences and age at which they occur. Specifically, individualistic and collectivist cultures may focus on different values and developmental goals, resulting in disparate developmental pathways of social cognition (Greenfield et al., 2003).

An I/C mindset is likely to impact the extent to which children favor deserving recipients in resource allocation decisions. Cultural norms regarding the social function of resource exchanges, as well as children's past experience with distribution, can influence these preferences (Schäfer et al., 2015). A focus on personal outcomes and ownership in individualistic cultures may affect conceptions of fairness (Callaghan & Corbit, 2018). Children may emphasize equitable distributions regarding need and merit at an earlier age since competition is often integral to achievement in these cultures. Alternatively, children from collectivist cultures may be less focused on individual resources due to a focus on group goals (Triandis, 2001). Currently, little is known regarding the developmental time course for integrating an individualistic or collectivist mindset into social decision-making. The present project addresses this gap in our knowledge by examining age-related changes in fairness preferences in children aged 4–11 across the world.

The Present Study

Past developmental research on social decision-making has mostly focused on children from so-called WEIRD (Western, Educated, Industrial, Rich, Democratic) populations (Henrich et al., 2010b; Nielsen et al., 2017), making it difficult to identify cross-cultural variations in the development of social preferences. Diversity in participant representation is necessary to determine which attributes of social cognition are universal among humans and which attributes are influenced by cultural learning and values (Nielsen et al., 2017). This study is unique in that it recruits a large sample of children from 13 countries, including non-WEIRD populations.

Although children were recruited from urban, industrialized environments within these countries, not all participating cities were Western, rich, or democratic. Participants also represent a range of cultures, which we define as "a collective programming of the mind that distinguishes the members of one group or category of people from others," (Hofstede, 2011). Specifically, this sample includes children from Argentina, Canada, Chile, China, Colombia, Cuba, Jordan, Mexico, Norway, South Africa, Taiwan, Turkey, and the United States.

Children from each country were invited to participate in three rounds of a distributive justice game to identify fairness preferences. In this game, children chose how to allocate four candy resources between two hypothetical recipients. The recipients were described with distinct characteristics in each round to illuminate the importance of wealth, merit, and empathy on children's fairness concerns. These conditions were chosen to determine how performance-based equity and need-based equity influence other-regarding preferences across cultures.

We predicted both commonalities and cultural differences in children's distribution decisions. It was hypothesized that younger children would favor equal distributions between two recipients in the distributive justice games, but older children would endorse equitable distributions over equal distributions, using disparate recipient characteristics as informational input in their social decision-making. In this context, equity-based distributions refer to unequal distributions based on perceived deservingness. Specifically, older children are likely to favor a hardworking recipient over a lazy recipient (Baumard et al., 2012) and disadvantaged recipients over well-off recipients (Rizzo et al., 2016) because they understand inequality as justified in these contexts. Although we expected these patterns to be similar in all 13 countries, we also predicted I/C levels would impact the age at which equitable preferences surfaced and the magnitude of these preferences.

Specifically, children from individualistic cultures may emphasize equitable distributions at an earlier age and to a greater degree than children from collectivist cultures. In individualistic cultures, personal work and wealth are essential to achievement and success (Triandis, 2001), which could lead children to attenuate earlier to cues of merit and need and view inequalities based on these factors as more acceptable (Almås et al., 2016). Children from collectivist countries are still expected to demonstrate an age-related shift from equal to equitable distribution decisions (Sigelman & Waitzman, 1991). However, this preference may emerge later and be less pronounced due to the importance of group cohesion and communal sharing (Robbins & Rochat, 2011). If supported, divergence in equity patterns between groups would suggest a role for cultural learning and socialization in shaping fairness preferences.

In order to address these hypotheses, we compared children's distributive justice decisions across 13 countries. Countries were culturally classified using Hofstede's 100-point scale of individualism and collectivism (0 = individualistic, 100 = collectivist). Culture can be viewed in many ways and some researchers disagree with this I/C classification. Although it is argued that the I/C dimension is sometimes conflated with other variables such as power (Oyserman, 2006), Hofstede's work is also well replicated and has been found to be a valuable construct in many studies (Jones, 2007). Relatedly, some argue that the I/C dimension is dichotomous and too simplistic (Killen & Wainryb, 2000). By using the I/C scale as a continuous measure, this study can classify culture in a nonbinary manner. It is also probable that people within a country differ on individual I/C levels, another common criticism of this classification system. Yet, even if individualistic and collectivist behaviors do exist within one culture, the priorities among more individualistic and more collectivist cultures are likely to differ (Greenfield et al., 2003). We therefore argue that the I/C scale cannot capture every measure of

culture but can provide insight into the prioritized values of a country's predominant culture. By considering the impact of the I/C mindset on children's resource allocation decisions, this project sheds light on current theories regarding the development of fairness and costly sharing.

2.1 Methods

Participants

A total of 2,696 children aged 4–11 were tested in 13 countries: Argentina, Canada, Chile, China, Colombia, Cuba, Jordan, Mexico, Norway, South Africa, Taiwan, Turkey, and the United States. The children came from major cities within each country, which were chosen for convenience and to represent a geographical range of urban environments. Research assistants within these cities recruited and tested children in one-on-one sessions at local universities or primary schools between 2015 and 2016 (see Appendix A for additional demographic and recruitment details). Parents also completed brief questionnaires. Both parents and children provided consent/assent to participate, and the University of Chicago Institutional Review Board (IRB) and the local IRB in each country approved these procedures.

During each session, children were asked to repeat the instructions of the games back to the research assistants before continuing on with the test trials. Children who did not understand the game and could not repeat the instructions properly were omitted from analysis. A total of 2,163 of the 2,696 total children (80.2% of children) aged 4–11 (50.1% female) were included in the omnibus analysis (see Table 2.1 for age and gender by country; see Appendix B for exclusion information).

Table 2.1

Age and Gender Distribution of Children Across Countries

	Age								
	4	5	6	7	8	9	10	11	**Total**
Argentina	21	12	17	17	15	20	21	12	135
Canada	42	42	45	37	40	18	6	8	238
Chile	10	11	19	27	24	22	23	17	153
China	21	21	21	20	20	10	10	10	133
Colombia	7	11	18	23	35	19	18	23	154
Cuba	39	23	22	21	22	28	16	15	186
Jordan	26	27	27	26	26	27	34	29	222
Mexico	20	33	24	25	20	20	22	20	184
Norway	10	10	8	14	8	20	14	17	101
S. Africa	24	28	18	20	20	20	17	28	175
Taiwan	15	10	10	14	10	9	16	9	93
Turkey	23	28	38	27	26	26	35	34	237
US	16	17	24	15	15	22	23	20	152
Total	274	273	291	286	281	261	255	242	2163

	Gender			
	Male	Female	Percent Female	**Total**
Argentina	75	60	44%	135
Canada	118	120	50%	238
Chile	65	88	58%	153
China	66	67	50%	133
Colombia	80	74	48%	154
Cuba	94	92	49%	186
Jordan	110	112	50%	222
Mexico	98	86	47%	184
Norway	54	47	47%	101
S. Africa	85	90	51%	175
Taiwan	46	47	51%	93
Turkey	116	121	51%	237
US	71	81	53%	152
Total	1078	1085		2163

Procedure

All study materials were prepared by the Child Neurosuite at the University of Chicago and translated into the local language of each of the 13 countries by native-language speakers.

All stimuli and instructions were back translated into English to ensure consistency between sites.

Measures

Distributive Justice Game

Children played three versions of a distributive justice game with candies. This was a within-subjects design in which every child participated in all three versions of the distributive justice game. In each game, children were given four candies, but they could not keep any candies for themselves. Children were presented with two hypothetical recipients and told they could share four candies with one of the recipients or both recipients. The recipients were gender and age-matched, but no information about group membership was given and stick figure images were used to represent these recipients (see Appendix J for full scripts and stimuli). The descriptions of the recipients varied during each version of the game to describe differences in wealth (amount of candy resources), merit (effort on homework), or elicited empathy (broken or unbroken leg). This was intentionally the only information given about the recipients so that distribution decisions would reflect equality and equity preferences regarding wealth, merit, and empathy disparities. The order of the three games was randomized and counterbalanced in 11 of the 13 participating countries. Analyses were conducted twice: first with the 11 countries that counterbalanced the order of the games, and second with the entire data from the 13 countries. Since most results did not differ between the two models, the 13-country analysis results are reported here, in order to focus on the sample with greater cultural variability. However, two significant results failed to reach significance in the 11-country analysis sample (see Appendix K for these results).

In the wealth condition, the recipients were described as poor in candies ("he/she has hardly any candies") or rich in candies ("he/ she has lots of candies"). This condition served as a baseline measure of equality preferences since the distributed resource could rectify the inequality between recipients. In the merit condition, the recipients were described as hardworking ("he/she did all of his/her work today") or lazy ("he/she played with all of his/her toys all day and did not work even though she/he had work to do"). In the empathy condition, one recipient was described as injured ("the boy/girl hurt his/her leg and the doctor put it in a cast until it gets better"), and one is described as uninjured ("he/she is not hurt with no broken leg"), thereby possibly evoking different levels of empathy from the participant. The child had to distribute all four candies but did not have to share with both recipients. A difference score in candies shared between the two recipients in each condition was calculated in the hypothesized direction to measure preferences to deviate from equality.

Cultural Analyses

To examine cultural differences beyond country-to-country comparisons, we categorized countries by I/C levels on a 100-point scale, with 100 indicating countries with the highest level of individualism and 0 corresponding to the most collectivist countries. This scale captures levels of I/C on a spectrum rather than forcing a dichotomous distinction between countries that are individualist or collectivist (Hofstede et al., 2010). Although people may differ in individual I/C levels within a country, this score reflects each country's integration of groups into society rather than the individual characteristics of the country's members. More individualistic cultures generally have looser ties between groups, with people looking after themselves, while more collectivist cultures have strongly integrated in-groups (Hofstede, 1980). The Hofstede I/C scores were treated as a continuous measure and z-scored in the analysis to examine differences

in equality and equity preferences based on cultural classification (see Table 2.2 for country Hofstede scores).

Table 2.2

Hofstede Score by Country (0=most collectivist, 100=most individualistic)

Country	Score
Argentina	46
Canada	80
Chile	23
China	20
Colombia	13
Cuba	12
Jordan	30
Mexico	30
Norway	69
S. Africa	65
Taiwan	17
Turkey	37
US	91

Parental Measures

Parents were asked to complete a questionnaire with demographic information, such as maternal education and total children in the family. Maternal education was used as a proxy for socioeconomic status (Winkleby et al., 1992), coded using a numeric scale from 1 to 6, and treated as a continuous variable. One indicates the highest levels of education (graduate/professional degree) and six indicates little to no education (0–5 years).

Analytical Strategy

A series of linear mixed-effects models were conducted to examine the influence of both fixed and random effects on children's allocation decisions. In this approach, the participant was entered as a random intercept nested within country, since every child played each version of the distributive justice game and the participant was inherently linked with country grouping in this sample. Each country's Hofstede score was also entered as a continuous fixed effect in the model

as a proxy for culture. In the following results, country refers to the nested random intercept and cultural effects refer to the fixed effects of the Hofstede score. Age was also treated as a continuous fixed effect, and both age and culture were z-scored in the models. In addition to subject, country, age, and culture, an "allocation type" contrast variable was created to account for the fact that every subject made three unique allocation decisions. The wealth condition was treated as the reference (wealth = 0; merit/empathy = 1) because this was the only condition where the allocated resources were directly relevant to the inequality between recipients. Therefore, the wealth condition can be used as a baseline measure for fairness preferences. Both main effects and interaction effects were considered for the age, culture, and allocation type variables.

The outcome variable reflects the allocation decision as a difference score of the numbers of candies shared between the two recipients in the distributive justice games. This score was calculated to measure the influence of recipient characteristics on the child's decision to deviate from equality. Prior to these analyses, it was hypothesized that children would exhibit more equitable distributions with age in every category. Specifically, it was predicted that older children would share more candies with the poor recipient compared to a rich recipient, a hardworking recipient compared to a lazy recipient, and the injured recipient compared to the uninjured recipient. Therefore, the difference score was a sum in these hypothesized directions (candies shared with the poor-rich; candies shared with the hardworking-lazy; candies shared with the injured-uninjured). In all instances, a positive score indicates equity in the hypothesized direction, a zero score indicates equality, and a negative score indicates equity in the opposite direction of the predicted response. Scores range from four to negative four in all conditions since children could only allocate a total of four candies between the two recipients and had to

share all four candies. Every child had three different scores pertaining to the three types of allocations. Multiple models were analyzed using the lme4 package in R (Bates et al., 2015) and all models are reported in the Appendix (see Appendix N for additional omnibus models).

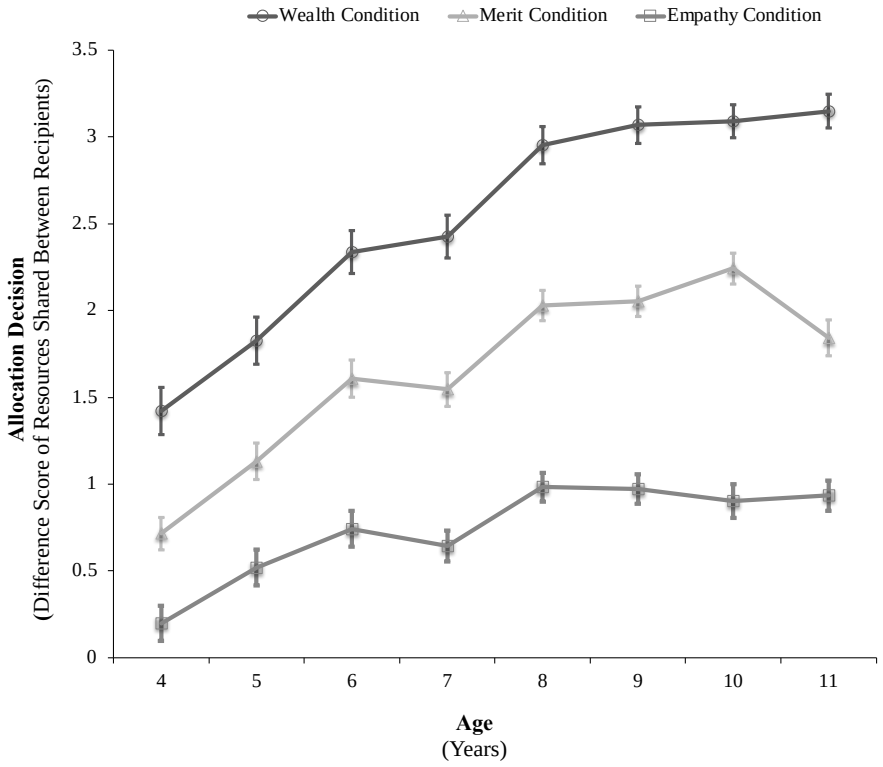
2.2 Results

Omnibus Analysis: Distributive Justice Games

A total of 2,163 participants were included in the distributive justice analysis. Results from the linear mixed-effects model reveal a statistically significant main effect of age ($b_{\text{unstandardized}} = 0.58$, $p < .001$), such that children allocate candies more equitably in the hypothesized direction as they get older. There was no significant main effect of culture ($b_{\text{unstandardized}} = 0.11$, $p = .13$), but children exhibited significantly diminished equity preferences in the merit ($b_{\text{unstandardized}} = -0.89$, $p < .001$) and empathy ($b_{\text{unstandardized}} = -1.79$, $p < .001$) conditions compared to the wealth condition. Age significantly interacted with allocation type in both the merit ($b_{\text{unstandardized}} = -0.15$, $p = .002$) and empathy ($b_{\text{unstandardized}} = -0.36$, $p < .001$) conditions relative to the wealth condition. Although children increase equitable distributions across conditions with age, disparities between recipients in wealth elicit greater age-related increases in equity preferences than disparities between recipients in merit. Likewise, equity preferences in the empathy condition appear to plateau by age 8 in contrast to the other conditions (Figure 2.1).

Figure 2.1

Allocation Decisions by Children Aged 4-11 by Condition

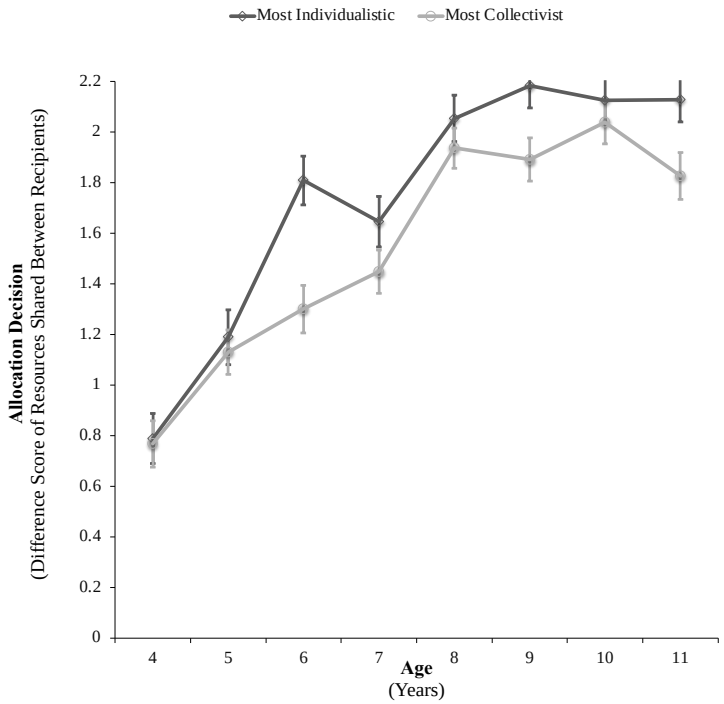


Notes: Difference scores were calculated in the following ways: Wealth, Candies shared with the poor – rich recipient; Merit, Candies shared with the hardworking – lazy recipient; Empathy, Candies shared with the injured – uninjured recipient. Error bars reflect standard error.

There was also a significant two-way interaction between age and cultural ratings on the Hofstede scale ($b_{\text{unstandardized}} = 0.07$, $p = .05$), suggesting that the developmental trajectory of equity varies by culture. Specifically, children from more individualistic cultures deviate from equality at a younger age compared to children from more collectivist cultures. Although 4- and 5-year-old children share similarly in the most individualistic and collectivist cultures, children from the most individualistic cultures show greater equity by age six compared to children from the most collectivist culture across conditions (Figure 2.2).

Figure 2.2

Allocation Decisions by Children Aged 4-11 by Culture Across All Conditions

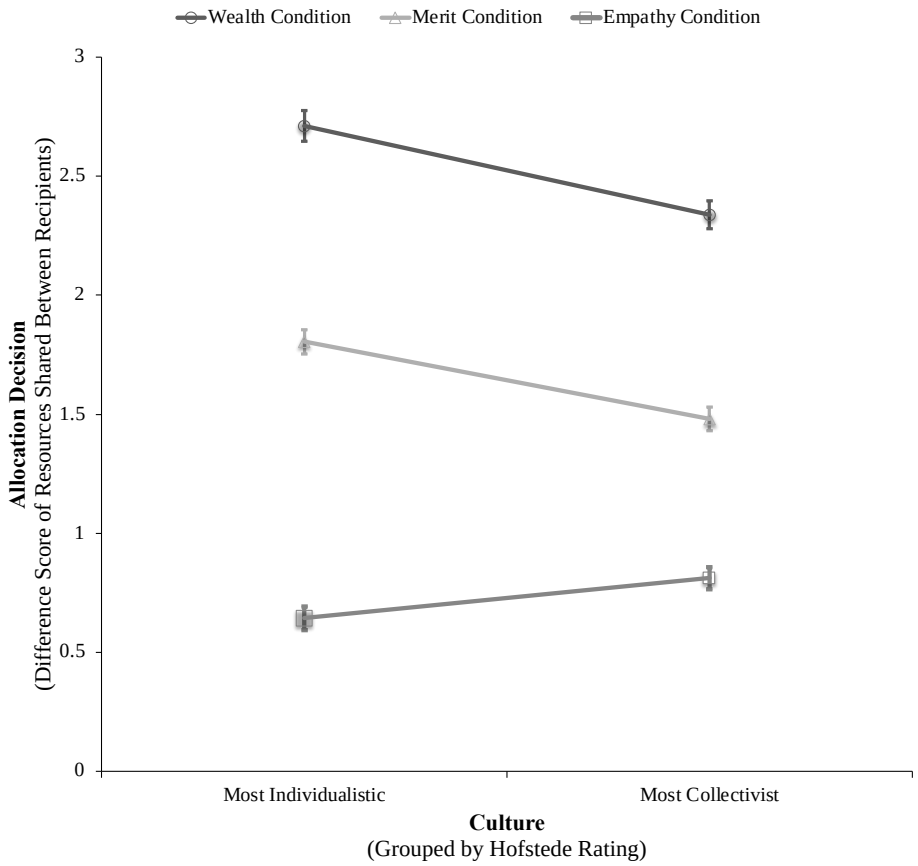


Note: Error bars reflect standard error.

The two-way interaction between culture and condition in the empathy condition ($b_{\text{unstandardized}}$ = -0.14, p = .005), but not in the merit condition ($b_{\text{unstandardized}}$ = 0.03, p = .57), was also significant. Children from more individualistic cultures endorse equity preferences to a greater extent than children from more collectivist cultures in the wealth and merit conditions, but the empathy context elicits the reverse trend such that children from more collectivistic cultures are more prone towards equitable distributions towards an injured recipient compared to children from more individualistic cultures (Figure 2.3).

Figure 2.3

Allocation Decisions by Condition and Culture Across All Ages



Note: Error bars reflect standard error.

None of the three-way interactions between age, culture, and condition were significant (see Appendix O for confidence intervals). In order to further break down these findings, individual models on each sharing game were conducted (see Appendix L for mean difference scores by age and condition). Additional covariates were included in these analyses and children of parents who did not complete the necessary demographic questionnaires were omitted from analysis (13.2% of the children). Between 13 and 27% of each country's sample was omitted and

the uniformity in exclusion percentages suggests that the games and questionnaires were appropriate across cities. A total of 1,878 children were included in the subsequent analyses.

Wealth Condition

Separate linear mixed-effects models were conducted to examine the influence of age, culture, and various covariates on allocation of candies in the wealth distributive justice game (see Appendix M for a comparison of condition-specific models). Each model examined the interaction between age and culture based on findings from the omnibus analysis, but we were also interested in how covariates of gender, maternal education, and total children in the family might affect the relationship between age, culture, and allocation preferences. Gender has been previously shown to influence sharing preferences (Benozio & Diesendruck, 2015; Burford et al., 1996). Additionally, I/C levels are often correlated with wealth (Hofstede, 2001), and maternal education was used as a measure of socioeconomic status (Winkleby et al., 1992). The total number of children in the family was also added to the models because family size and structure is often related to the I/C dimension. For instance, people in more collectivistic societies may live together for economic reasons (Kagitcibasi, 2005), whereas living on one's own is considered a more individualistic characteristic and increases with urbanization in collectivistic societies (Elder et al., 1996; Seymour, 1999). Therefore, Model A examined the interaction of age and culture alone, Model B examined the interaction of age and culture as well as the influence of gender, and Model C examined the interaction of age and culture as well as the influence of maternal education and total children, since both of these covariates are related to the family's economic structure and status. Consistent with the omnibus analysis, the participant variable was entered as the random intercept nested with country in these models. The models were compared using Akaike information criterion (AIC), and Model C had the

lowest AIC score of the three models (Model C 7825.409 AIC compared to Model A 7845.216 AIC and Model B 7846.664 AIC). Analysis of variance (ANOVA) tests comparing Model C with Model A ($F(2,1872) = 11.94$, $p < .001$) and comparing Model C with Model B ($F(1,1872) = 23.33$, $p < .001$) find that Model C is a significantly better fit than the other models in the wealth condition.

Results of Model C on the average difference score of candies shared with a poor–rich recipient reveals a statistically significant main effect of age ($b_{unstandardized} = 0.63$, $p < .001$) and culture ($b_{unstandardized} = 0.15$, $p = .001$). Children endorse equitable strategies over equal strategies to a greater extent as they get older and children from more individualistic countries favor equity to a greater extent than children from more collectivist countries. The two-way interaction between age and culture was not significant ($b_{unstandardized} = 0.07$, $p = .13$).

There was also a significant effect of total children in the family on allocation decisions ($b_{unstandardized} = -0.21$, $p < .001$), such that increases in total children in the family diminish equity preferences. Maternal education was not a significant predictor of allocation decisions ($b_{unstandardized} = -0.05$, $p = .10$).

Merit Condition

The same three linear mixed-effects models were conducted to examine the impact of age, culture, gender, maternal education, and total children in the family on allocation preferences in the merit condition (see Appendix M). All three models had similar AIC scores (Model A 7047.334 AIC, Model B 7049.321 AIC, and Model C 7048.466), but Model C is reported to keep models between the wealth, merit, and empathy analyses consistent.

Results reveal a statistically significant main effect of age ($b_{unstandardized} = 0.46$, $p < .001$) and culture ($b_{unstandardized} = 0.18$, $p < .001$). Similar to the pattern of results for the wealth

condition, children increased equitable distributions with increases in age and children from more individualistic cultures endorse equity more than children from more collectivistic cultures. There was no significant interaction between age and culture ($b_{unstandardized}$ = -0.06, p = .08), and neither the covariate of maternal education ($b_{unstandardized}$ = 0.02, p = .40), nor total children in the family ($b_{unstandardized}$ = -0.06, p = .13) was significant.

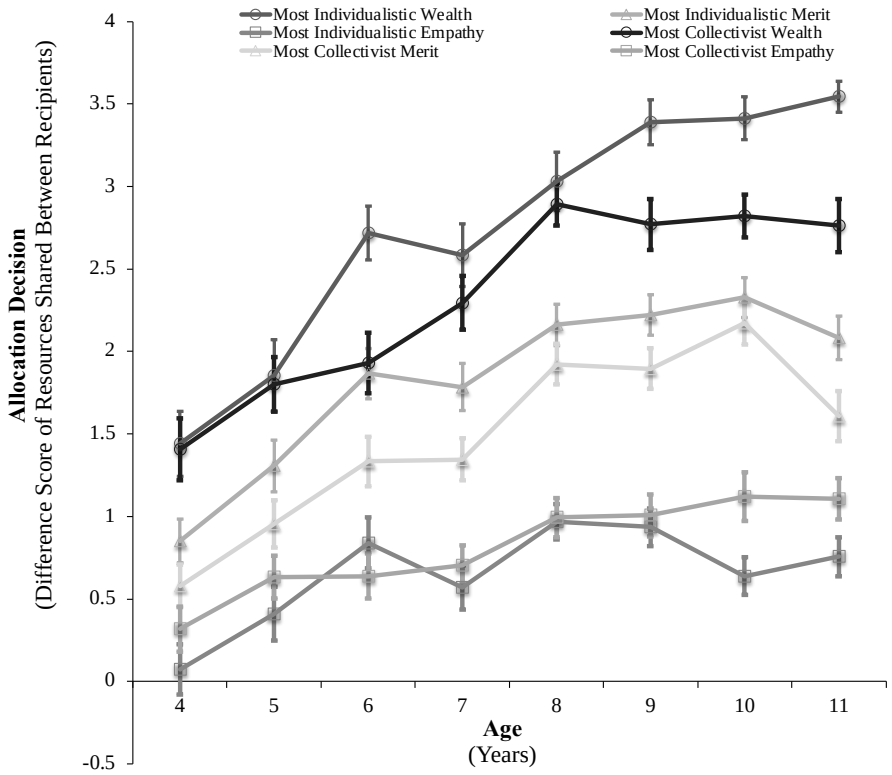
Empathy Condition

Finally, in the analysis of empathy, the same three linear mixed-effects models were compared for model fit in predicting allocation preferences between an injured and uninjured recipient (see Appendix M). Model C had the lowest AIC score at 6953.994 (compared to 6954.032 for Model A and 6955.621 for Model B) and was a marginally significantly better fit than Model B (F(1,1872) = 3.62, p = .06). Model C results indicate a statistically significant main effect of age ($b_{unstandardized}$ = 0.18, p < .001) and total children in the family ($b_{unstandardized}$ = 0.07, p = .05). Similar to the wealth and merit conditions, children progressed from equality-based distribution strategies towards distribution strategies that favored the injured recipient, as they got older. Unlike results in the wealth condition, children distributed equitably in favor of the injured recipient more with increases in total children in the family.

Age-related advances in equity preferences were similar across the three conditions, and culture did not predict variance in children's equity preferences between an injured and uninjured recipient ($b_{unstandardized}$ = -0.02, p = .55), contrary to the wealth and merit conditions. Notably, the average differences scores are much lower in the empathy condition than the wealth and merit condition overall. There was also not a significant main effect of maternal education ($b_{unstandardized}$ = -0.02, p = .50), and the two-way interaction between culture and age ($b_{unstandardized}$ = -0.04, p = .32) was not significant.

Figure 2.4

Allocation Decisions by Culture, Distributive Justice Condition, and Age



Notes: Condition shares shapes (wealth = circles, merit = triangles, empathy = squares). Error bars reflect standard error.

2.3 Discussion

Current empirical evidence supports both universal and cultural-specific fairness preferences. On one hand, there appear to be cross-cultural commonalities in that children become more generous with age (Cowell et al., 2017; Rochat et al., 2009). However, there are also differences in sharing behavior, perceptions of fairness, and inequity aversion between children from diverse societies (Blake et al., 2015a; House et al., 2013). Determining which aspects of fairness motivations align between cultures, and those that diverge, will help elucidate mechanisms driving prosocial behavior. By examining social decision-making in children aged

4-11 from a variety of cultures, including non-WEIRD populations, this study allows for an investigation of I/C levels on the development of fairness and adds insight to this debate. This study finds similarities in children's decisions in distributive justice games across 13 countries, as well as differences in the developmental time-course and magnitude of these preferences.

Children exhibited comparable age-related changes in resource allocation preferences across 13 countries with diverse cultural I/C ratings. Hypotheses were supported in that children were more willing to distribute resources equitably with age, consistent with a body of literature suggesting an increased preference for equity over equality throughout development (Rizzo et al., 2016; Schmidt et al., 2016). Older children gave more candies to a poor recipient, a hardworking recipient, and an injured recipient. Likewise, children from each culture found wealth differences between recipients to be the most motivating reason to distribute candies equitably, followed by merit, and then empathy. The significant influence of condition suggests that children may be motivated to rectify differences in wealth, merit, and empathy for different reasons. Favoring of the poor over rich recipient could be due to early-emerging empathetic responses towards the needy (Paulus, 2014), while merit may be a motivating cue because hard work signals an advantageous social partner (Baumard et al., 2012). Although children likely possess both preferences, the desire to help a recipient in need may be stronger than the desire to favor an advantageous partner in a third-party distributive justice game because the child does not stand to gain in resources. Empathy may have been the least motivating condition to distribute equitably because injury could be more difficult to think about in terms of deservingness. Fairness-based resource allocations depend on the ability to translate abstract intuitions into concrete rewards (Jara-Ettinger et al., 2016), and it is possible that children do not think about injury and health in terms of rewards. The specific nature of the candy resource may

have also influenced decision-making. Distributions in the wealth condition could equalize the inequality and candy may seem like a valid reward for hard work, but not a valid comfort for injury.

Although these sharing patterns persisted across countries, the age at which equity preferences emerged and the degree to which equitable distributions were demonstrated in each condition varied between cultures. Children from more individualistic cultures exhibited stronger preferences to deviate from equality compared to children from more collectivist cultures when recipients differed in terms of wealth and merit. Disparity in physical pain between recipients was the least motivating reason to distribute candies unequally overall; however, children from collectivist cultures appear to favor the injured recipient more in this context than children from individualistic cultures. Children from more individualistic cultures also endorsed equitable over equal distribution patterns at an earlier age than children from more collectivist cultures. Research suggests that children from Western cultures care about reputation at an earlier age than children from non-Western societies, given an emphasis on autonomy (Blake et al., 2015a; H. Keller et al., 2006), and consequently, may internalize fairness norms earlier in development. One potentially informative ecological perspective on the I/C dimension suggests that individualistic societies may have evolved from hunting and gathering societies that emphasized achievement and self-reliance (Berry, 1971). Thus, children may attenuate to differences in wealth and merit earlier because independent effort and resource acquisition were critical factors for success in these environments. Alternatively, if more collectivist societies evolved from societies that emphasize obedience and responsibility in pastoral farming (Berry, 1971), children may be less concerned with individual differences in wealth and merit since food production would be shared among the group. Although the evolutionary origins of I/C societies are highly

debated and not all collectivist or individualistic cultures evolved from pastoral or hunter-gather societies, respectively, this theory does offer one possible explanation for the current pattern of results. The developmental trajectory of fairness may follow a universal progression from equality to equity concerns, but the ecology and culture of a child's environment still appears to matter in the time-course of this trajectory. Analyses examining age and culture interactions in the wealth, merit, and empathy conditions help clarify this relationship.

Children from the most individualistic countries demonstrated the strongest preference to favor the poor. In individualistic countries, people are often independent economic actors who do not expect resources to be provided from family (Hofstede et al., 2010), and thus, reputation matters. Children from individualistic cultures are also likely to internalize values regarding autonomy, personal property, and independence (Cialdini et al., 1999; Kim & Choi, 1994). Norms regarding individual possession and ownership can lead to an emphasis on equality in individualistic societies (Paulus, 2015), which may facilitate distributions that rectify inequalities or boost reputation. This concern for reputation may have motivated children from the most individualistic countries to share more with a poor participant compared to children from the most collectivist societies in our sample. Wealth is also highly correlated with individualism (Hofstede et al., 2010), and consequently, resource quantity may be more valued among participants from individualistic countries, motivating the decision to give to the poor over the rich recipient. Similarly, levels of market integration and the amount of economic exchange with unfamiliar others has been shown to affect generosity in sharing tasks (Henrich et al., 2005). Therefore, children may attend to differences in material resources at an earlier age in societies that depend on individual achievement and reputation for success.

In the wealth condition, the total number of children in the family was also a significant predictor of allocation decisions. Children from larger families were less likely to exhibit equity-based distribution strategies in the hypothesized direction than children with fewer siblings. Prior work on family composition and prosocial behavior reports that children's helping behavior is correlated with frequency of family chores (Rehberg & Richman, 1989). Participants from larger families, with more children to help out around the house, may complete fewer chores with implications for helping behavior. Likewise, children from larger families have been found to exhibit less comforting behavior than children from smaller families (Rehberg & Richman, 1989) and, consequently, may be less concerned with the poor recipient's neediness.

Children from the most individualistic countries also favored the hardworking recipient to a greater degree than children from more collectivist cultures. Individualistic cultures that value personal goals over group goals (Triandis, 2001) are likely to glorify work ethic, since this may be necessary to get ahead in life. Even preschool-aged children in the United State exhibit attenuation to merit in resource allocation decisions (Kanngiesser & Warneken, 2012). Consequently, children in these cultures may view a hardworking recipient as socially dominant. Preschool-aged children also perceive dominant individuals as having more resources (Charafeddine et al., 2015), and a recipient's social value is influential in resource allocation decisions (Charafeddine et al., 2016). In the most individualistic societies, hardworking recipients may have greater value and children may want to ingratiate themselves with perceived dominant recipients (Olson et al., 2011). Previous research has shown that children from Germany divide resources based on merit to a greater extent than children from Kenya and Namibia, partly due to differences in socialization (Callaghan & Corbit, 2018; Schäfer et al., 2015). In line with these results, adults from individualistic cultures perceive merit-based equity

as fairer than adults from collectivist cultures (Murphy-Berman & Berman, 2002). All children are likely to see the inherent value of hard work, but the magnitude of performance-based equity preferences differs by culture.

While children from the most individualistic cultures exhibited the greatest willingness to deviate from equality in wealth and merit conditions, results revealed a different pattern in the empathy condition. There was no significant effect of culture in the empathy condition-specific analysis. However, a general trend of children from the most collectivist cultures favoring an injured recipient to a greater extent than children from the more individualist cultures emerged. Injury to others may be more psychologically distant in individualistic countries, whereas people with interdependent views of the self are highly sensitive to the emotions of others (Markus & Kitayama, 1991). Therefore, seeing another person in distress may be more motivating to children from collectivist cultures, facilitating more equitable distributions compared to children in more individualistic cultures. Additionally, in collectivistic countries where the social system does not ensure that the needy (i.e., single parents, the disabled, the elderly) receive some assistance through the government, children are socialized to take care of each other, which may increase their prosocial behaviors (Yağmurlu et al., 2005). Importantly, equitable distributions in the empathy condition were the least pronounced of all three conditions. Injury appears to be a less motivating reason to deviate from equality than material need or hard work.

Children from families with more siblings favored equitable distributions in this condition to a significantly greater extent than children from smaller families, in contrast to results in the wealth condition. Older siblings in the family can aid in socialization (Rabain-Jamin et al., 2003), and in doing so, can impact the development of empathy (Tucker et al., 1999). For example, only children born in China under the One-Child policy are less trusting and

cooperative compared to children born before the policy who are more likely to have grown up with siblings (Cameron et al., 2013). Children with a greater number of younger siblings may need to help care for others, and both caregiving and playtime can foster prosocial development (Hastings et al., 2007). Family composition appears to affect a concern with material and physical need differently.

The empathy condition was also unique in terms of age-related differences. While children's preference for equity-based distributions increased overall between ages 4 and 11 in the wealth and merit conditions, the pattern of favoring the injured in the empathy condition plateaued around age 8. Even the oldest children appear reluctant to endorse equity when allocating resources between an injured and uninjured recipient. Thus, although both material and nonmaterial need motivate departures from equality, the type of need does appear to matter.

Prior theories explaining the development of equity preferences posit that older children have an enhanced ability to relate to the emotional state of a recipient in need (Malti et al., 2012; Paulus, 2014). Results from the empathy condition analysis necessitate a different explanation. It is possible that younger children respond to material need and physical pain similarly, but as children get older, the development of cognitive abilities may regulate emotional responses to physical need (Decety, 2010; Decety & Svetlova, 2012). Even if older children experience an emotional response to an injured recipient, this feeling may not be enough to motivate sharing. The ability to recognize the emotions of others does not necessarily lead to prosocial behavior, and in fact, can even promote antisocial behaviors (Decety & Cowell, 2014, 2018; Jensen et al., 2014; Zahavi & Rochat, 2015). Older children may recognize that sharing candies does not alleviate physical pain and be less motivated to favor an injured recipient with candies. Children may also view the experience of injury as more temporary than poverty or laziness, which could

influence willingness to share resources. This would lend support to theories suggesting empathy facilitates prosocial behavior (Eisenberg & Miller, 1987), but prosocial behavior becomes more dependent on cognitive functioning and socialization with age (Decety & Cowell, 2018; Decety et al., 2018).

Taken together, results from three variations of a distributive justice game indicate that there are common age-related trends in fairness preferences between cultures, but I/C levels and family composition also predict differences. Consistent with prior research, children across cultures demonstrate greater deviation from equality in favor of needy and hardworking recipients, as they get older (Baumard et al., 2012; Paulus, 2014). These similarities among diverse groups suggest that human cooperation is not merely a product of socialization and cultural learning. However, culture appears to impact the strength of these preferences and the age at which these preferences emerge, consistent with prior cross-cultural research (Blake et al., 2015a; Cowell et al., 2017). Children from the most individualistic countries exhibited stronger preferences to favor a poor or hardworking recipient compared to children from collectivist cultures. Conversely, children from more collectivist cultures generally cared about differences in physical pain to a greater extent than children from individualistic cultures. Social norms and values do appear to impact conceptions of fairness (Henrich et al., 2005; House et al., 2013), and culture may influence developmental pathways in unique ways. More collectivist cultures promote development towards an interdependent self, with a focus on norm conformity (Greenfield et al., 2003). The value of the interdependent self in collectivist cultures may have evolved as an adaptation to ecological conditions in smaller, more subsistence-based economies where group harmony influenced food production more than individual achievement (Berry, 1971). Alternatively, more individualistic societies promote development towards an

independent self with a focus on individuation, which may have developed in larger, urban communities with greater anonymity and need for independent success (Greenfield et al., 2003). These findings add insight into current theories on the development of fairness, suggesting interplay between universal underpinnings of prosocial concerns and cultural socialization.

More work is needed to further determine the extent of cultural influence on sharing preferences. This study provides evidence for a role of socialization in fairness preferences, but a lack of direct measures of social cognitive factors limit the ability to conclude more. For instance, prior work suggests that advanced theory of mind and executive functioning promote sharing behavior (Cowell & Decety, 2015; Cowell et al., 2017; Imuta et al., 2016), but these factors do not uniformly increase generosity. Likewise, previous research finds cultural differences in cognitive style and context-sensitivity (Imada et al., 2013). Asking children about the basis and justification for their distribution decisions may provide insight on cultural values and reasoning. It will also be useful to compare individual cultural measures in future studies. Hofstede's individualism and collectivism construct has been criticized as potentially conflating I/C with power and equality dimensions of culture (Oyserman, 2006), and it is difficult to control multiple dimensions without explicitly measuring these constructs at the individual level. Further research could directly manipulate I/C levels to investigate the casual nature between I/C mindsets and fairness preferences. It is also possible that culture influences the value of resources used in the game with implications for sharing behavior. Future work should assess fairness preferences with more varied resources and assess the value of resources prior to distribution decisions. Examining cognitive abilities, individual measures of culture, and utilizing more valuable resources in the tasks may help elucidate the impact of culture on prosocial development.

Despite these limitations, this study contributes to our understanding of the development of fairness. The desire to be fair appears at a young age and similarities in fairness cognitions persist across cultures. Children favor disadvantaged and deserving individuals in distributive justice tasks, as they get older. However, I/C levels impact the age at which these preferences surface and the strength of these preferences, suggesting that children internalize and integrate cultural norms into their conceptions of fairness as they develop. Wealth disparity is a more motivating reason to depart from equality than inequities in merit or injury in every culture, though the most motivating in individualistic cultures, suggesting that children learn to pay attention and care about differences in material need at a young age. The desire to offset differences in the wealth and merit conditions only increases with age, while equitable preferences in the empathy condition plateau in children. Even though young children's responses to pain or distress may initially facilitate prosocial behavior, the motivation to help others may differ in older children. The mechanisms driving sharing behavior and cooperation may shift throughout the developmental time-course. Future work will benefit from examining the differential contributions of both genetics and the environment in shaping the social mind.

2.4 Appendix H: Recruitment Information and Additional Demographic Details

Table S2.1

Population Estimates and Recruitment Information Across Urban Environments in 13 Countries

Country	City	Population Estimate	Primary Language	Recruitment Method	Testing Location
USA	Chicago	2,720,546	English	Families recruited through a database	University laboratory testing space
Jordan	Amman Karak	4,000,000 316,000	Arabic	Families at primary schools contacted directly	Testing room within primary schools
Taiwan	Taipei	2,691,000	Mandarin Chinese	Families called directly from the laboratory	University laboratory testing space
Mexico	Mexico City	20,137,152	Spanish	Families at primary schools contacted directly	Testing room within primary schools
Colombia	Bogota Villavicencio	10,352,000 506,000	Spanish	Families at primary schools contacted directly	Testing room within primary schools
Argentina	Buenos Aires	2,891,000	Spanish	Families at primary schools contacted directly	Testing room within primary schools
Canada	Toronto	5,000,000	English	Families recruited through a database	University laboratory testing space
South Africa	Cape Town	3,774,000	Afrikaans & English	Families at primary schools contacted directly	Testing room within primary schools
Chile	Santiago	7,000,000	Spanish	Families at primary schools contacted directly	Testing room within primary schools
Norway	Bergen	278,556	Norwegian	Families at primary schools contacted directly	Testing room within primary schools
Cuba	Havana	2,106,146	Spanish	Families at primary schools contacted for recruitment at the laboratory	University laboratory testing space
China	Guangzhou	12,000,000	Mandarin Chinese	Families at primary schools contacted directly	Testing room within primary schools
Turkey	Istanbul Izmir	14,804,116 2,500,603	Turkish	Families at primary schools contacted directly and social media recruitment	Testing room within primary schools

2.5 Appendix I: Additional Information about Sample Size and Exclusions

Table S2.2

Detailed Exclusion Information

Country	N_1	N_2	% retained	N_3	% retained
Argentina	172	135	78%	102	59%
Canada	293	238	81%	220	75%
Chile	175	153	87%	113	65%
China	165	133	81%	89	54%
Colombia	196	154	79%	123	63%
Cuba	219	186	85%	182	83%
Norway	131	101	77%	98	75%
South Africa	211	175	83%	161	76%
Taiwan	116	93	80%	89	77%
Turkey	323	237	73%	224	69%
USA	195	152	78%	139	71%
Jordan	275	222	81%	155	56%
Mexico	225	184	82%	183	81%
Total	**2,696**	**2,163**	**80%**	**1878**	**70%**

Notes: Column N_1 indicates frequency of child observations tested in each country. Column N_2 indicates frequency of child observations included in the omnibus analysis after excluding children who could not understand the tasks. Column N_3 indicates frequency of child observations included in the condition-specific analyses after exclusions due to missing parental data. The first *percent retained* column refers to the percent of children from the total observations retained in the omnibus analysis. Children with missing data were still included in the omnibus analysis since no parental covariates were included in this analysis (N = 2,163). The second *percent retained* column refers to the percent of children from the total observations retained in the condition-specific analyses (N = 1,878).

2.6 Appendix J: Stimuli and Scripts for Distributive Justice Games

Scripts:

Wealth

We're going to play a game with candies. These boys/girls [GENDER MATCH] here love candies. This boy/girl here has lots of candies. This boy/girl over here has hardly any candies. Can you show me which boy/girl has lots of candies? Which one only has a few candies? Great! In this game, you get to decide how many candies you want to give to each boy/girl. Do you understand? Great! Now, here are 4 candies. You have to give all of them away, but you get to decide how many you give to each boy/girl. How many do you want to give to this boy/girl (gesture to first boy/girl), and how many do you want to give to this boy/girl (gesture to second boy/girl)?

Merit

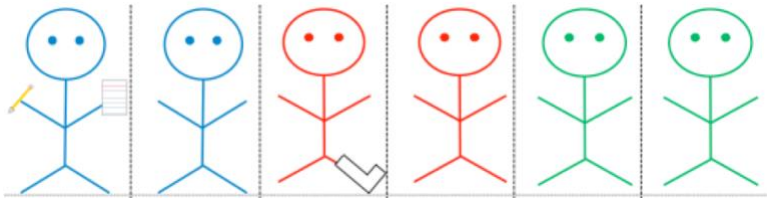
We're going to play a game with candies. These boys/girls [GENDER MATCH] here love candies. This boy/girl here has done all of his/her work. This boy/girl over here has just played with his/her toys all day, even though s/he had work to do. S/he has done no work today. Can you show me which boy/girl has done lots of work today? Which one has done no work? In this game, you get to decide how many candies you want to give to each boy/girl. Do you understand? Great! Now, here are 4 candies. You have to give all of them away, but you get to decide how many you give to each boy/girl. How many do you want to give to this boy/girl (gesture to first boy/girl), and how many do you want to give to this boy/girl (gesture to second boy/girl)?

Empathy

We're going to play a game with candies. These boys/girls [GENDER MATCH] here love candies. This boy/girl here hurt his/her leg and it is broken. The doctor put it in a cast until it gets better. This boy/girl over here has not hurt his/her leg. His/her leg is not broken. Can you show me which boy/girl has a broken leg in a cast? Which one does not have a broken leg? In this game, you get to decide how many candies you want to give to each boy/girl. Do you understand? Great! Now, here are 4 candies. You have to give all of them away, but you get to decide how many you give to each boy/girl. How many do you want to give to this boy/girl (gesture to first boy/girl), and how many do you want to give to this boy/girl (gesture to second boy/girl)?

Figure S2.1

Stimuli for Distributive Justice Games



Notes: Blue figures were used to represent recipients in the merit condition. Red figures were used to represent recipients in the empathy condition. Green figures were used to represent recipient in the wealth condition.

2.7 Appendix K: 11-Country Sample Omnibus Analysis

We conducted the omnibus model with 11 instead of 13 countries, removing Jordan and Cuba from the sample, due to a lack of counterbalancing in Jordan and Cuba. We examined the impact of age, culture, the allocation type conditions (wealth, merit, empathy), and their interactions on distributive justice allocation decisions. Subject was also entered as a random intercept nested within country in this model. Results are presented below.

Omnibus Analysis Results with the 11 Country Sample:

Random Effects		
	Variance	Standard Deviation
Subject ID:Country	0.1003	0.3167
Country	0.0632	0.2513

Fixed Effects				
	Estimate	SE	*t*	*p*
Intercept	2.65	0.09	30.77	< .001
Age	**0.65**	**0.04**	**16.00**	**< .001**
Culture	0.06	0.08	0.69	.504
Condition1 (Empathy)	**-2.05**	**0.06**	**-37.22**	**< .001**
Condition2 (Merit)	**-0.97**	**0.06**	**-17.69**	**< .001**
Age*Culture	0.04	0.04	1.08	.281
Age*Condition1	**-0.39**	**0.06**	**-7.00**	**< .001**
Age*Condition2	**-0.22**	**0.06**	**-3.92**	**< .001**
Culture*Condition1	-0.01	0.05	-0.26	.795
Culture*Condition2	0.06	0.05	1.09	.277
Age*Culture*Condition1	-0.08	0.05	-1.46	.143
Age*Culture*Condition2	-0.04	0.05	-0.82	.411

Note: Wealth is always the baseline condition when comparing the effect of the wealth, empathy, and merit conditions on resource allocation decisions.

2.8 Appendix L: Descriptive Statistics

Table S2.3

Mean Wealth Difference Scores of Allocation Decisions by Age and Country

Country	Age							
	4	5	6	7	8	9	10	11
Argentina	2.10	1.83	1.76	1.65	1.87	3.50	3.62	3.83
Canada	1.48	2.19	3.42	3.46	3.50	3.44	4.00	3.50
Chile	1.20	2.36	2.11	1.63	2.67	3.09	2.43	3.30
China	1.71	1.76	2.76	3.40	3.70	2.80	3.60	2.40
Colombia	-0.29	1.82	3.11	3.39	3.37	3.37	3.56	3.57
Cuba	2.05	1.92	1.55	2.00	3.09	3.14	3.38	3.60
Jordan	1.00	1.11	0.96	1.31	1.77	1.26	1.47	1.24
Mexico	0.60	2.18	2.25	1.92	2.60	3.00	3.45	2.70
Norway	0.80	1.00	3.25	3.71	3.00	3.40	3.86	3.88
S. Africa	-0.25	0.43	1.00	0.70	1.30	2.70	2.24	2.86
Taiwan	2.00	1.60	0.40	3.14	3.20	3.56	3.50	3.78
Turkey	2.26	2.64	2.79	2.44	3.92	3.38	3.60	3.82
USA	2.25	2.59	3.08	3.20	3.73	3.86	3.39	3.6

Note: These difference scores were computed as candies shared with the poor-rich recipient.

Table S2.4

Mean Merit Difference Scores of Allocation Decisions by Age and Country

Country	Age							
	4	5	6	7	8	9	10	11
Argentina	0.48	0.67	1.18	0.71	2.53	2.00	2.48	1.83
Canada	1.24	1.67	2.18	2.00	2.30	2.67	2.33	2.25
Chile	1.20	1.27	1.37	1.04	1.75	1.91	1.91	1.29
China	0.67	0.86	1.43	1.60	1.70	1.40	2.20	1.80
Colombia	1.43	1.64	2.78	2.00	2.69	1.89	2.78	2.87
Cuba	0.21	0.70	1.18	0.95	2.27	1.86	2.38	1.87
Jordan	0.77	1.11	0.96	1.15	1.46	2.30	1.82	0.76
Mexico	0.30	0.61	0.67	1.12	1.10	1.60	2.45	1.40
Norway	1.20	0.00	2.00	1.86	2.25	1.70	2.00	2.00
S. Africa	0.67	1.39	1.11	1.40	1.80	2.00	2.82	2.14
Taiwan	0.67	1.40	1.40	1.86	2.20	2.00	2.00	1.56
Turkey	0.61	1.29	1.84	2.00	1.85	2.54	2.29	1.94
USA	0.75	1.53	2.33	2.53	2.40	2.36	2.09	2.40

Note: These difference scores were computed as candies shared with the hardworking-lazy recipient.

Table S2.5

Mean Empathy Difference Scores of Allocation Decisions by Age and Country

Country	**Age**							
	4	5	6	7	8	9	10	11
Argentina	0.38	-1.00	0.94	0.47	1.06	0.80	1.05	1.50
Canada	0.33	0.19	0.98	0.49	1.00	0.78	1.00	0.50
Chile	-0.20	0.00	0.11	1.04	0.75	1.09	1.04	0.59
China	-0.38	0.19	0.10	0.10	1.10	1.00	1.00	1.80
Colombia	-0.29	0.36	0.78	0.52	1.20	1.37	1.56	0.96
Cuba	0.15	0.70	0.55	0.10	1.27	1.14	1.00	0.80
Jordan	2.08	1.41	1.93	1.31	1.54	0.96	1.65	1.86
Mexico	0.10	0.61	0.67	1.20	0.30	0.90	0.73	0.60
Norway	-0.40	0.60	0.50	0.43	1.75	0.90	0.71	0.71
S. Africa	-0.17	1.00	1.67	0.50	0.80	1.60	0.82	1.07
Taiwan	-0.40	0.40	-0.80	0.14	0.00	0.00	0.38	0.89
Turkey	-0.35	0.79	0.63	0.44	0.54	0.69	0.40	0.35
USA	0.25	0.24	0.33	1.33	1.33	0.91	0.35	0.70

Note: These difference scores were computed as candies shared with the injured-uninjured recipient.

2.9 Appendix M: Best-fit Models for the Condition Specific Analysis

Table S2.6

Model Comparison in the Wealth Condition

Model	Parameters	*b*	*p*	AIC
A	Age	0.60	< .001***	7845.27
	Culture	0.13	.005 **	
	Age*Culture	0.06	.228	
B	Age	0.60	< .001***	7846.66
	Culture	0.13	.005 **	
	Gender	0.07	.458	
	Age*Culture	0.05	.233	
C	Age	0.64	<.001***	**7825.41**
	Culture	0.15	<.001**	
	Maternal Education	-0.05	.105	
	Total Children in the Family	-0.21	< .001***	
	Age*Culture	0.05	.128	

Notes: Three linear mixed-effects models were conducted in the wealth-specific analysis to estimate the best model fit for predicting resource allocation preferences between recipients differing in number of candies (poor or rich). All continuous measures were z-scored. Model A is the simplest model, examining just age and culture as predictors. Model B includes gender as a predictor in the model. Model C adds maternal education and total children in the family as predictors. Model C was the best fit based on the AIC scores and analysis of variance tests, ($F(2, 1872) = 11.94$, $p < .001$) and Model B ($F(1,1872) = 23.33$, $p < .001$).

Table S2.7

Model Comparison in the Merit Condition

Model	Parameters	*b*	*p*	AIC
A	Age	0.45	< .001***	7047.33
	Culture	0.17	< .001***	
	Age*Culture	-0.07	.066	
B	Age	0.45	< .001***	7049.32
	Culture	0.17	< .001***	
	Gender	0.01	.911	
	Age*Culture	-0.07	.066	
C	Age	0.46	< .001***	**7048.47**
	Culture	0.18	< .001***	
	Maternal Education	0.02	.398	
	Total Children in the Family	-0.06	.133	
	Age*Culture	-0.06	.083	

Notes: The same three linear mixed-effects models were conducted in the merit-specific analysis to estimate the best model fit for predicting resource allocation preferences between recipients differing in work effort. All continuous measures were z-scored. Model C was reported in the results section to maintain consistency since all three models had relatively close AIC scores. No models were significantly different in fit (Model A and

Model C, $F(2,1872) = 7.11$, $p = .24$; Model A and Model B, $F(1,1873) = 0.01$, $p = .91$; Model B and Model C, $F(1,1872) = 2.85$, $p = .09$).

Table S2.8

Model Comparison in the Empathy Condition

Model	Parameters	*b*	*p*	AIC
A	Age	0.19	< .001***	6954.03
	Culture	-0.01	.783	
	Age*Culture	-0.03	.382	
B	Age	0.19	< .001***	6955.62
	Culture	-0.01	.782	
	Gender	-0.05	.522	
	Age*Culture	-0.03	.388	
C	Age	0.18	< .001***	**6953.99**
	Culture	-0.02	.553	
	Maternal Education	-0.02	.504	
	Total Children in the Family	0.07	.055	
	Age*Culture	-0.04	.318	

Notes: The same three linear mixed-effects models were conducted in the empathy-specific analysis to estimate the best model fit for predicting resource allocation preferences between recipients differing in pain (injured or uninjured). All continuous measures were z-scored. Model C had the lowest AIC score. Although Model C is not a significantly better fit for the data than Model A ($F(2,1872) = 2.01$, $p = .13$), it is a marginally significantly better fit for the data compared to Model B ($F(1,1872) = 3.62$, $p = .06$). Model A and Model B do not significantly differ ($F(1,1873) = 0.41$, $p = .52$). Model C was also reported for consistency with the wealth model.

2.10 Appendix N: Exploration of Omnibus Models

Three linear mixed-effects models were conducted to explore the best fit for the omnibus model. All three models included subject nested within country as a random intercept, and only the fixed effects differed between models. Continuous measures were z-scored in all models.

Table S2.9

Model Comparison for Omnibus Models

Model	**Parameters**	***b***	***p***	**AIC**
A	Age	0.41	<.001***	26444.88
	Culture	0.08	.265	
B	Age	0.41	<.001***	25358.41
	Culture	0.11	.173	
	Condition1(Empathy)	-1.79	<.001***	
	Condition2(Merit)	-0.88	<.001***	
	Culture:Condition1	-0.12	.019 *	
	Culture:Condition2	0.04	.419	
C	Age	0.58	<.001***	**25336.72**
	Culture	0.12	.135	
	Condition1(Empathy)	1.79	< .001***	
	Condition2(Merit)	-0.89	< .001***	
	Age*Culture	0.07	.053	
	Age*Condition1	-0.39	< .001***	
	Age*Condition2	-0.15	.002**	
	Culture*Condition1	-0.14	.005 **	
	Culture*Condition2	0.03	.568	
	Age*Culture*Condition1	-0.09	.077	
	Age*Culture*Condition2	-0.09	.071	

Note: AIC = 25336.72 for Model C was significantly lower than the AIC for Model A (X^2 (15) = 1166.1, p < .001) and Model B (X^2 (15) = 54.5, p < .001).

2.11 Appendix O: Confidence Intervals for the Omnibus Models

Here we list the confidence intervals for the reported omnibus model:

Parameter	**2.5%**	**97.5%**
Intercept	2.369	2.661
Age	0.510	0.653
Culture	-0.027	0.263
Condition1 (Empathy)	-1.889	-1.690
Condition2 (Merit)	-0.984	-0.786
Age* Culture	-0.001	0.145
Age*Condition1	-0.457	-0.259
Age*Condition2	-0.252	-0.054
Culture *Condition1	-0.241	-0.042
Culture *Condition1	-0.070	0.128
Age* Culture *Condition1	-0.191	0.010
Age* Culture *Condition2	-0.193	0.008

CHAPTER 3: THE ROLE OF DIVERSE SOCIAL CONTEXTS ON SHARING DECISIONS IN MIDDLE CHILDHOOD

With age, children exhibit an increasingly sophisticated understanding of fairness. In the preschool years, children understand fairness as equality, but they are relatively selfish in sharing decisions (Gummerum et al., 2010; Smith et al., 2013). Children are more likely to share their own resources equally as they get older (Fehr et al., 2008), and by middle childhood, children start to prefer equitable distributions that rectify inequalities between recipients over equal distributions (Rizzo & Killen, 2016). Multiple mechanisms underlying this transition have been posited, including the development of more domain-general processes like Theory of Mind and executive functioning (Cowell et al., 2017), a more nuanced understanding of number concept (Chernyak et al., 2016), and a developing shift in the desire to appear fair (Shaw et al., 2014). While these theoretical accounts highlight the importance of several social cognitive abilities underlying complex fairness behaviors and judgments, they do not focus as heavily on the impact of environmental features on the development of fairness preferences.

Yet, children's fairness preferences do differ across environments. Although most children exhibit a greater concern with fairness as they get older, there are still cultural variations in the development of costly sharing behavior, advantageous inequity aversion, and judgments of equality and equity (House et al., 2013; Blake et al., 2015a; Huppert et al., 2019). These cross-cultural differences often surface around ages 5-8, when children are particularly sensitive to social cues, suggesting that variations in children's fairness behaviors and judgments may be a response to contextual features or local norms (House & Tomasello, 2018; House et al., 2020a). Therefore, middle childhood may be an important time for children to adjust their sharing behavior and equity judgments based on unique considerations related to their environment. In the present study, we consider how costly sharing, equity concerns, and related mechanisms of

empathy and executive functioning in children aged 5-8-years-old unfold across varied contexts that differ in overall resource levels in Bolivia, Cambodia, and Haiti.

Resource levels are an important feature to consider in the development of fairness preferences because resource variations in both the immediate environment, such as fluctuations in basic internal regulatory states (i.e., hunger), and broader environment (i.e., resource constraint associated with poverty or socioeconomic status) have been found to impact sharing and related social cognitive abilities. However, previous research examining the impact of children's hunger and socioeconomic status on sharing has led to conflicting findings. Hungrier children have been found to share less resources in costly sharing games compared to their more satiated peers (Huppert et al., 2020), and children from lower socioeconomic status neighborhoods share fewer resources relative to children from higher socioeconomic status neighborhoods in Britain and Romania (Benenson et al., 2007; Safra et al., 2016). Chronic poverty has been shown to decrease early self-regulatory abilities, with longer exposure to poverty in early childhood predicting worse executive functioning (Raver et al., 2013). At the same time, hungry infants share resources with others, including strangers (Barragan et al., 2020), and children from lower income households have been found to donate more prizes than children from higher income households in America and China (Miller et al., 2015; Chen et al., 2013). These findings indicate that both the internal and external environment can affect children's sharing behavior and a related mechanism of executive functioning, but the exact nature of this relationship is unclear.

Work with adults further illustrates this complicated relationship. Scarcity can increase attention on pressing need (Shah et al., 2015), leading hungry people to focus more on hunger-related cues in the environment (e.g., Radel & Clément-Guillotin, 2012; Mogg et al., 1998). Attending to scarcity cues motivates people to engage in behaviors that improve their welfare

(Roux et al., 2015), which in the case of hunger, often results in seeking food. Hungry adults are both less willing to part with their resources and more motivated to acquire additional resources in comparison to more satiated adults (Briers et al., 2006; Xu et al., 2015). Likewise, people from lower socioeconomic neighborhoods share less monetary resources than their peers of higher socioeconomic status and are less likely to cooperate, in the form of returning lost letters (Nettle et al., 2011; Holland et al., 2012). Resource constraint may lead people to prioritize immediate over future rewards (Pepper & Nettle, 2017), motivating the acquisition of resources possibly at the expense of cooperative motives.

Yet, living in a resource scarce environment might make a strong safety network important for survival, leading to a greater concern with prosociality when facing deficits in income, stress, or hunger (Piff et al., 2010; Faber & Häusser, 2022). Consistent with this theory, adults with low blood sugar express greater support for welfare systems, a modernized system of sharing (Aarøe & Peterson, 2013). Experiencing scarcity might also promote prosocial behavior by enhancing identification and empathy towards others in need. For instance, adults who were slightly hungry were more willing to donate to food pantries in comparison to fully satiated adults, possibly because they could better identify with the hungry beneficiaries (Harel & Kogut, 2015). Therefore, resource constraint might increase the willingness to share, particularly with those in need, by influencing reciprocity concerns or empathy.

Taken together, past work, primarily in adults, highlights the contradictory effects of two environmental factors - hunger and income constraint - on fairness behaviors and judgments. In the present study, we attempt to reconcile these conflicting findings and elucidate the role of the environment in the development of costly sharing and equity concerns by examining how hunger and income levels interact to predict children's willingness to share resources that are directly

relevant to offsetting hunger (i.e., candies) or less relevant (i.e., stickers). We also consider whether the recipient's need state (hungry or full) impacts sharing.

If hunger motivates resource acquisition behavior, thereby reducing sharing, then these effects might be exacerbated in low-income environments, since need is likely greater in these areas. Past work has linked poorer environments with lower executive functioning (Raver et al., 2013), which can also lead to less sharing behavior. Executive functioning, or cognitive control, refers to capacities that are important for engaging in goal-directed behaviors, including self-regulation, inhibitory control, and working memory (Miyake et al., 2000; Zelazo & Carlson, 2012). Executive functioning abilities increase with age and consist of two distinct components: hot executive functioning, which refers to cognitive control and regulation during affective situations, and cool executive functioning, which refers to cognitive control and regulation during neutral situations (Hongwanishkul et al., 2005; Zelazo & Carlson, 2012). Past research finds that greater inhibitory control and self-regulation predict prosocial behaviors in some circumstances (Blake et al., 2015b; Steinbeis, 2018), but not all (Smith et al., 2013; Blake, 2018). Therefore, we were interested to see if hunger and income predicted lower levels of hot and cool executive functioning and less sharing behavior. We thought it was possible that children might be less likely to share any resource when experiencing scarcity, particularly if executive functioning is diminished, but we also consider whether hungry children may be especially less likely to share food, since food can alleviate hunger. We consider the interaction between hunger, income level, and resource in predicting overall sharing behavior and examine how sharing decisions relate to executive functioning abilities across ages and environments.

Another proposed mechanism driving prosocial behavior is empathy, or the ability to recognize and be sensitive to another person's emotional state, which motivates behaviors

involving caring or helping (Decety et al., 2016; Abrams et al., 2015). Empathy emerges early in development and has been found to increase with age across cultures (Kozloff et al., 2021). We thought it was possible that hunger might influence sharing with other hungry recipients by increasing empathy towards those experiencing the same need. If hunger increases empathy towards hungry recipients, thereby increasing sharing, then it is also possible that hungrier children from low-income environments might feel greater empathy and share more relative to children in higher-income environments. Children may be more likely to share food with hungry recipients if they are prioritizing sharing with relevant resources. Therefore, hunger, income level, and resource might interact to predict favoring of a hungry over a full recipient in sharing decisions (hunger-based equity), and we consider the relationship between empathy and a hunger-based equity preference.

To address these questions, we recruited children from low-income and high-income locations in Bolivia, Cambodia, and Haiti and asked them to participate in sharing games before and after eating lunch. Comparing groups both between-countries and within-countries allowed us to consider a wide range of environments that varied in terms of resource and income levels. We focused on sharing within 5-8-year-olds due to the importance of middle childhood for the development of costly sharing behaviors, executive functioning, and empathy (e.g., Zelazo & Carlson, 2012; Litvack-Miller et al., 1997). We expected children to share more resources as they got older across countries (e.g., Cowell et al., 2017; Kozloff et al., 2021), but we were interested to see how hunger, income, and resource would interact to predict sharing behaviors and equity preferences during a critical developmental window for prosociality and sensitivity to social context (Abrams et al., 2015; Fabes & Eisenberg, 1998; House et al., 2020a). By doing so, findings from this study can address competing theories regarding the impact of resource scarcity

on prosocial behavior and shed light on the role of social environment in shaping sharing decisions and related mechanisms in middle childhood.

3.1 Methods

Participants

Nine hundred and eighteen children aged 5-to-8-years-old (M_{age} = 6.51, SD_{age} = 1.12, 50.4% female), were recruited from six locations across Bolivia, Cambodia, and Haiti (two locations/country). The testing locations were selected using household surveys from the World Bank, which provides spatial distributions of poverty within each country (see Table 3.1 for information on testing locations).

Table 3.1

Characteristics and Demographics of Testing Locations

Country	**Cities for Testing**	**Population**	**Low-income neighborhoods**		**High-income neighborhoods**		**Testing Location**	**Language of Testing**
			Average Income	Average Family Size	Average Income	Average Family Size		
Bolivia	La Paz; El Alto	1,800,000 within each city	$360.00/ month	7 family members	$670.00/ month	5 family members	A mix of public and private schools participated; Testing occurred in quiet, private rooms within each school	Spanish
Cambodia	Phnom Penh City; Kampot province	3,129,371 and 592,845	$440.00/ month	4.6 family members	$624.50/ month	2.1 family members	All testing took place in public schools within each neighborhood; Testing occurred in quiet, private rooms within each school	Khmer
Haiti	Port-au-Prince	3,744,077	$70.00/ month	8 family members	$360.00/ month	4 family members	All testing took place in public schools within each neighborhood; Testing occurred in quiet, private rooms within each school	Creole

Country

We recruited children from Bolivia, Cambodia, and Haiti because of the national poverty rates in these countries and prevalence of undernourishment based on data from UNICEF, the FAO world hunger map and the World Bank, which measures undernourishment by the percent of the population whose food intake is insufficient to meet dietary energy requirements continuously. Based on the most recent data available, the poverty headcount ratio at the national poverty line was 37.2% in Bolivia in 2019, 17.7% in Cambodia as of 2012, and 58.6% in Haiti in 2012.[3]

Age

We aimed to recruit 960 total children aged 5-8 years from these six locations. Our goal was to collect data from 40 children per age group per income area in each country.

Exclusions

Children participated in two testing sessions, spaced a few months apart; one testing session occurred before children ate lunch at school and one testing session occurred after children ate lunch at school. Hunger (as time of testing around eating lunch) was manipulated within-subjects.

Observations were excluded from analysis if children were absent from the second testing session, or if children did not understand the study tasks. We also excluded observations in which recording errors led to an impossible value from a task (i.e., the value of resources shared and kept did not add up to the total resources allotted per game). If children had difficulty with tasks or impossible values were recorded just within one session, then observations from both sessions were excluded to ensure balanced samples between the two sessions.

[3] Data comes from the World Bank: https://data.worldbank.org/indicator/SI.POV.NAHC

After exclusions, the resulting sample size used for analysis included 313 children aged 5-8-years-old in Bolivia (158 children from lower income areas, 155 from higher income areas), 292 children aged 5-8-years-old in Cambodia (139 children from lower income areas, 153 higher incomes areas), and 313 children aged 5-8-years-old in Haiti (154 children from lower income areas, 159 from higher incomes areas; see Table 3.2).

Table 3.2

Number of Children in Each Age Group by Income Area and Country

Country	**Age (years)**								**Total**
	5		**6**		**7**		**8**		
	Higher income	Lower income	Higher income	Lower income	Higher income	Lower income	Higher income	Lower income	
Bolivia	39	39	37	40	40	39	39	40	313
Total	*78*		*77*		*79*		*79*		
Cambodia	36	34	38	35	38	32	41	38	292
Total	*70*		*73*		*70*		*79*		
Haiti	39	39	40	40	40	40	40	35	313
Total	*78*		*80*		*80*		*75*		
Total	226		230		229		233		**918**

Procedure and Materials

All testing procedures were approved by each Institutional Review Board of the home institution of the researchers in Bolivia, Cambodia, and Haiti and the Institutional Review Board at the University of Chicago. All children provided assent before participating.

Researchers from Chicago, Bolivia, Cambodia, and Haiti aligned on procedures during Skype sessions in English to ensure that the assent documents, task materials, and instructions were consistent across countries (see Appendix Q for more information). After training, the research team in each country translated the materials into the local language.

Hunger Manipulation

Children participated in two testing sessions throughout the year-long study to manipulate hunger. The order in which time of testing occurred (before vs. after lunch) was randomized across participants to ensure any effects of hunger were not due to the order in which testing sessions occurred. Half of the participating children had their first testing session scheduled before eating lunch, and then a few months later, they participated in the second testing session after eating lunch. For the other half of participating children, the reverse was true: their first testing session was scheduled after eating lunch and their second testing session was scheduled before eating lunch. We used time of testing as our hunger manipulation to minimize idiosyncratic differences in eating patterns and hunger levels. Meal-time patterns have been shown to influence circadian rhythms and hunger levels, and lunch time has been used as a manipulation of hunger in past work with adults (LeSauter et al., 2009; Danziger et al., 2011). To confirm this manipulation was effective, we assessed self-reported hunger using a child-friendly scale that included pictures of sad and happy faces corresponding to being "very hungry" or "not at all hungry" (*1 = not at all hungry* to *6 = very hungry*). Similar visual analog scales have been used to assess hunger with children even younger than those in our sample (Bennett & Blissett, 2014; Huppert et al., 2020). Comprehension of the scale was not an issue in any testing locations (see Appendix Q for this scale).

Dependent Variables

Sharing. Children participated in sharing tasks with two different resources during each session, resulting in four sharing decisions per child: sharing with stickers before eating lunch, sharing with food before eating lunch, sharing with stickers after eating lunch, sharing with food after eating lunch.

In the food version of the task, children were given six candy resources, which were chosen by local experimenters in each area to ensure that the type of candies were popular in each location. In the sticker version of the task, children were shown an assortment of 20 stickers and asked to choose the best six stickers to play with during the task. The experimenter also confirmed with each child that they liked the resources. The order in which the games were played (stickers vs. candies) was randomized and counterbalanced across participants.

After receiving six resources, children were told that they could keep all six resources if desired, but the experimenter would not have time to play the game with every student in the school (always gender matched). The child could choose to share some or all the resources with other classmates who would not get to play the game. The experimenter described two potential student recipients to the child: a hungry and a full recipient. Each recipient was characterized by a cardboard stick figure. The hungry recipient looked very skinny and was described as hungry, whereas the "full" recipient looked round and was described as having just eaten a full meal (e.g., Huppert et al., 2020). The same stick figures were used in all testing locations.

The experimenter emphasized that the choice of whether to keep or share resources was a private, anonymous choice. The child could keep or share as many resources as they wanted by placing the resources among three different envelopes. The child was told to put any resources for the hungry recipient in an envelope in front of the skinny cardboard stick figure, any resources for the full recipient in an envelope in front of the round cardboard stick figure, and any resources that they wanted to take home into their own envelope. The child had to correctly verify which envelope belonged to each recipient to move forward with playing the game. The child distributed the resources among the envelopes in private (the experimenter closed their eyes; see Appendix Q for full script).

The child played two games in each session - one with stickers and one with candies - and made two choices within each game: 1) the choice of how many resources to share, if any; 2) of the shared resources, how to distribute these resources between hungry and full recipients.

Cognitive Measures. Following both sharing tasks, executive functioning and empathy were assessed.

Cool executive functioning. Cool EF was assessed using a variation of a "Simon Says" game (Strommen, 1973), which measures inhibitory control. The experimenter explained that they would be in the role of "Simon" and that the child had to repeat Simon's actions when the experimenter (as Simon) said "Simon Says," but not when the experimenter did not say "Simon Says." The experimenter gave examples of correct and incorrect trials and the child participated in multiple practice rounds. Children who did not understand the game after learning the instructions and playing seven practice rounds were excluded from the analysis. Children who successfully learned the instructions participated in 10 active trials: five activation trials meant to activate movement ("Simon Says" leads the movement) and five inhibition trials meant to inhibit movement (there is no leading "Simon Says").

The correct response on these 10 trials could either be a full commanded movement or no movement based on the presence of a leading "Simon Says," and correct responses were coded as a "3." Partial commanded movements (i.e., starting to move and stopping) on activation trials and flinches on inhibition trials were coded as a "2"; flinches on activation trials and partial commanded movements on inhibition trials were coded as a "1"; contradictory responses (i.e., no movement on activation trials and full commanded movements on inhibition trials) were coded as "0." The experimenters in all three countries were trained by the first author via Skype on best practices for coding the movements so that flinches and partially commanded movements were

understood similarly across testing locations. The specific movements for each trial (i.e., touching ears, touching knees) were chosen ahead of time and practiced on Skype so that children received the exact same instructions across locations (see Appendix Q). These scores were summed together, with higher scores indicative of greater cool EF.

Hot executive functioning. Hot EF was measured with a delayed gratification task using a deck of cards in which each card featured images of stickers and candies (Prencipe & Zelazo, 2005). All card decks were made by the Chicago research team and distributed to researchers to ensure consistency across locations (see Appendix Q for cards).

Each card displayed a choice between a smaller, immediate reward or a larger, future reward of the same resource. For instance, a card might depict the choice between one sticker now or two stickers later. There were six cards in the deck, three cards of which presented choices with stickers and three of which presented choices with candies. The option for the present reward was always one resource and the option for the future rewards was always multiple resources (either two, four, or six stickers or candies). The experimenter also illustrated each decision depicted on the cards with real resources.

Children were given their own sticker card for any immediate sticker rewards. If the child wanted an immediate reward, they could take one reward for now (either eating the candy or putting the sticker on the sticker card). Children were also given an envelope for resources to take home and told any resources that they wanted to keep for later would go inside the envelope. Children could move real resources during each round of the game (candies or stickers in the envelope, one sticker on the sticker card, one candy to eat). The experimenter completed two demonstration trials of the game and the child completed two practice rounds. When ready to play, the cards were randomly shuffled and presented one at a time to randomize the order of

choices across participants. A tally was taken of the total number of times the child chose to delay rather than eat the candy or use the sticker immediately, with six indicating the highest level of willingness to delay gratification and greater hot EF.

Empathy. Empathy was assessed using a booklet that was modeled off a previous computerized task using visual stimuli depicting images of painful situations (Decety et al., 2008; 2018). Children viewed ten total images that showed hands or feet in various scenarios that might elicit pain (i.e., stepping on a sharp object, cutting one's finger while slicing fruit, etc.). Since the pictures only included hands or feet, there were no facial or gender cues from the person experiencing pain. Children were told that each image represented a child in a painful situation, and they were asked to rate how sorry they felt for the child on a 6-point scale (*1 = Not at all sorry, 6 = Extremely Sorry*; see Appendix Q). Individual scores were summed across ten stimuli to derive an empathy score ranging from 10-60, with 10 reflecting low empathy and 60 reflecting high empathy.

3.2 Results

Hunger Manipulation Check

Results from a one-way Analysis of Variance (ANOVA) confirmed that time of testing led to significant differences in self-reported hunger, ($F(1, 3670) = 1099.89$, $p < .001$, $\eta_p^2 = .23$), such that children reported being hungrier in testing sessions before lunch ($M_{reported\_hunger} = 3.79$, $SD_{reported\_hunger} = 1.80$) compared to after lunch ($M_{reported\_hunger} = 1.99$, $SD_{reported\_hunger} = 1.48$) across countries. The effect of time of testing on self-reported hunger within each county individually was also significant (see Appendix P).

Sharing Models

Analytical Strategy

Our core research interest was in determining whether the environmental features of hunger, income, and resource type influenced children's willingness to engage in costly sharing (how much to share overall) and, when sharing, children's choices of how to distribute resources between recipients differing in need (resources shared with the hungry versus full recipient). Since these choices of how many resources to keep, share with the hungry, and share with the full were not independent, we examine the interaction between hunger, income, and resource on two separate outcomes in a series of linear mixed-effects models. Specifically, we consider the interaction between hunger (before eating lunch versus after eating lunch), income (lower versus higher income neighborhood), and resource (food vs. stickers) on 1) the number of resources shared overall (numeric sharing), and 2) the distribution of resources shared with a hungry-full recipient (recipient distributions). Income area (0 = lower income area, 1= higher income area) was included as a between-subjects factor, and hunger (0 = before lunch, 1 = after lunch) and resource (0 = candies, 1 = stickers) were included as within-subjects factors in a series of linear mixed-effects models, with subject modelled as a random intercept, since every subject participated in the sharing games four times.

We expected the number of resources shared to increase between ages five to eight, and our primary interest in examining children in this age range was to explore the influence of environmental factors on sharing behaviors and related mechanisms during a key window for the development of these processes. Therefore, we added age as a predictor in our models.

Our interest in conducting this study cross-culturally was to ensure a range of different locations that varied in terms of resource levels and social environment. We conducted the sharing models described above a second time with country added to the model to examine whether there were country-level effects on sharing. Across all four sharing observations, children

from Bolivia shared the most frequently (out of 1252 sharing observations, children shared at least one resource 72% of the time), followed by Cambodia (out of 1168 sharing observations, children shared at least one resource 70% of the time), and then Haiti (out of 1252 sharing observations, children shared at least one resource 45% share of the time). The average number of shared resources (pooled) was greatest in Bolivia (M = 2.69, SD = 2.13), followed by Cambodia (M = 2.56, SD = 2.17) and then Haiti (M = 1.21, SD = 1.79). Given that Haiti showed the most differentiation in sharing relative to the other two countries, we coded the categorical three-level country variable with Haiti as the reference. In these models, our categorical country variable examines how children share in Cambodia relative to Haiti and how children share in Bolivia relative to Haiti.

We conducted four linear-mixed effects models examining 1) the hunger x income x resource interaction, as well as the effects of age, on number of resources shared; 2) the hunger x income x resource interaction, as well as the effects of age, on the difference score of resources shared with a hungry-full recipient; 3) the hunger x income x resource interaction, as well as the effects of age and country on number of resources shared; 4) the hunger x income x resource interaction, as well as the effects of age and country on the difference score of resources shared with a hungry-full recipient. The lme4 package in R was used to conduct these analyses (Bates et al., 2015).

Numeric Sharing

We examined the effects of hunger, income area, resource, and their interactions, with age added as a predictor, on the number of resources shared. Children could share up to six resources, with higher numbers reflecting greater sharing, collapsed across recipient type.

In this linear mixed-effects model, there was a main effect of resource (b = -0.26, p = .011), such that children shared more candies (M = 2.22, SD = 2.16) relative to stickers (M = 2.08, SD = 2.13). There was also a main effect of age (b = 0.23, p < .001), such that children shared more resources (pooled) as they got older ($M_{5\text{-year-old}}$ = 1.72, $SD_{5\text{-year-old}}$ = 2.11; $M_{6\text{-year-old}}$ = 2.14, $SD_{6\text{-year-old}}$ = 2.21; $M_{7\text{-year-old}}$ = 2.29, $SD_{7\text{-year-old}}$ = 2.13; $M_{8\text{-year-old}}$ = 2.43, $SD_{8\text{-year-old}}$ = 2.05).

The main effects of hunger, income area, two-way and three-way interactions were not significant (ps > .179; see Table 3.3).

When adding country to the model, we find a similar pattern of effects. There was a main effect of resource (b = -0.26, p = .011) and age (b = 0.22, p < .001), reflecting greater sharing of candies than stickers and increased sharing with age. There was also a main effect of country, such that children in Bolivia shared significantly differently relative to children in Haiti (b = 1.48, p < .001) and children in Cambodia shared significantly differently relative to children in Haiti (b = 1.34, p < .001). This pattern was driven by the fact that children from Haiti shared less resources than children from Bolivia and Cambodia. A series of linear mixed-effects models conducted on subsets of the data indicate that children from Bolivia (M = 2.69, SD = 2.13) and Cambodia (M = 2.56, SD = 2.17) did not significantly differ in the number of resources shared (b = -0.13, p = .324). However, children in Haiti (M = 1.21, SD = 1.79) shared significantly less resources than children in Bolivia (b = -1.48, p < .001) and Cambodia (b = -1.35, p < .001).

The main effects of hunger, income area, two-way and three-way interactions were not significant (ps > .179; see Table 3.3).

Table 3.3

Model Comparisons

Model	Predictors	Fixed Effects	*b*	*p*	AIC
Numeric Sharing					
A	Hunger x income x resource + age	Hunger	0.13	.214	15054
		Income	0.03	.806	
		Resource	-0.26	.011*	
		Age	0.23	<.001*	
		Hunger x Income	-0.04	.767	
		Hunger x Resource	0.14	.333	
		Income x Resource	0.20	.179	
		Hunger x Income x Resource	-0.20	.326	
B	Hunger x income x resource + age + country	Hunger	0.13	.214	14891
		Income	0.04	.787	
		Resource	-0.26	.011*	
		Age	0.22	<.001*	
		Country1 (Bolivia v. Haiti)	1.48	<.001*	
		Country2 (Cambodia v. Haiti)	1.34	<.001*	
		Hunger x Income	-0.04	.767	
		Hunger x Resource	0.14	.333	
		Income x Resource	0.20	.179	
		Hunger x Income x Resource	-0.20	.326	
Difference Score Recipient Distributions					
C	Hunger x income x resource + age	Hunger	0.08	.460	15016
		Income	0.19	.138	
		Resource	-0.29	.012*	
		Age	0.12	.001*	
		Hunger x Income	-0.17	.276	
		Hunger x Resource	-0.09	.564	
		Income x Resource	0.09	.578	
		Hunger x Income x Resource	0.15	.511	
D	Hunger x income x resource + age + country	Hunger	0.08	.460	15004
		Income	0.19	.139	
		Resource	-0.29	.012*	
		Age	0.11	.001**	
		Country1 (Bolivia v. Haiti)	0.31	.001**	
		Country2 (Cambodia v. Haiti)	0.36	<.001*	
		Hunger x Income	-0.17	.276	
		Hunger x Resource	-0.09	.564	
		Income x Resource	0.09	.578	
		Hunger x Income x Resource	0.15	.511	

Notes: Akaike information criterion (AIC) was generated using the anova function in R. Adding country to the model improved model fit for both sets of models (numeric sharing Model A vs. Model B, $p < .001$; difference score recipient distributions Model C vs. Model D, $p < .001$).

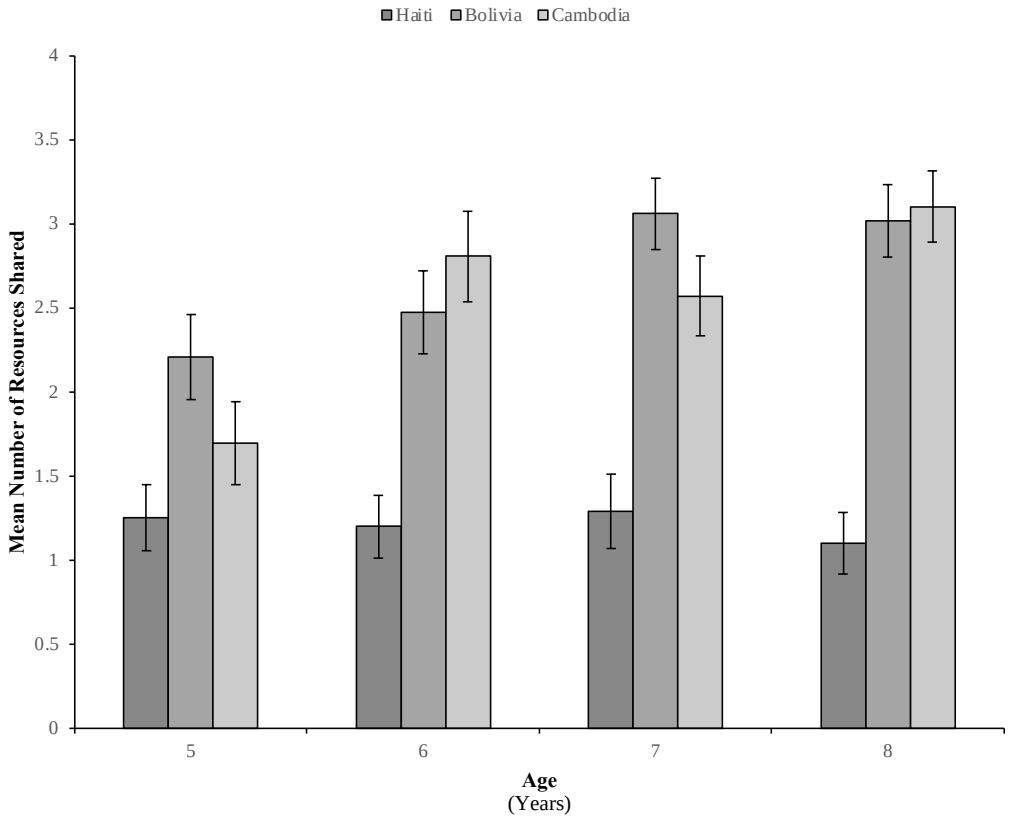
Age and Country Effects on Numeric Sharing

To further examine the effects of age and country we conducted a linear mixed-effects model examining the age x country interaction on the number of resources shared. There was a main effect of country. Children in Cambodia shared significantly differently than children in Haiti (b = -1.45, p = .043). The main effect of sharing in Bolivia relative to Haiti and the main effect of age were not significant (ps > .316).

These results were qualified by significant age x country interactions (age x sharing in Bolivia relative to Haiti, b = 0.34, p = .002; age x sharing in Cambodia relative to Haiti, b = 0.43, p < .001). As illustrated in Figure 3.1, these interactions reflect the fact that sharing increases with age in Bolivia and Cambodia but not in Haiti. Separate models examining the impact of age on sharing within each country alone provide evidence for these disparate developmental trends (age on sharing just within Bolivia, b = 0.30, p < .001; age on sharing just within Cambodia, b = 0.39, p < .001; age on sharing just within Haiti, b = -0.03, p = .614).

Figure 3.1

Mean Number of Resources Shared (Pooled) by Age and Country



Note: Error bars reflect the 95% confidence interval.

Recipient Distributions

To examine the effects of hunger, income area, resource, and their interactions, with age added as a predictor, on the distribution of resources shared with the hungry and full recipient, we computed a difference score of number of resources shared with the hungry versus full recipient as our outcome variable. Positive scores reflect greater sharing with the hungry over the full recipient, scores of zero reflect no preference in distributions, and negative scores reflect less sharing with the hungry compared to the full recipient. Scores ranged from negative six to six.

Zero scores that reflect no preference in distributions encompass both children who share equally with the hungry and full recipient and non-sharers who kept all resources.

In this linear mixed-effects model, there was a main effect of resource (b = -0.29, p = .012), such that children exhibited less favoring of the hungry relative to the full recipient when sharing stickers (M = 0.48, SD = 1.88) than candies (M = 0.73, SD = 1.95), though distributions did favor the hungry over the full recipient with both resources. There was also a main effect of age (b = 0.12, p = .001), such that children exhibited greater favoring of the hungry over the full recipient as they got older ($M_{5\text{-year-old}}$ = 0.34, $SD_{5\text{-year-old}}$ = 1.76; $M_{6\text{-year-old}}$ = 0.63, $SD_{6\text{-year-old}}$ = 2.14; $M_{7\text{-year-old}}$ = 0.74, $SD_{7\text{-year-old}}$ = 1.97; $M_{8\text{-year-old}}$ = 0.70, $SD_{8\text{-year-old}}$ = 1.77).

The main effects of hunger and income area, two-way and three-way interactions were not significant (ps > .138; see Table 3.3).

When adding country to this same model, there was a main effect of resource (b = -0.29, p = .012) and age (b = 0.11, p = .001), reflecting greater favoring of the hungry relative to full recipient when sharing candies compared to stickers and greater favoring of the hungry recipient with age. There was also a main effect of country, such that children in Bolivia distributed resources between the hungry and full recipient significantly differently than children in Haiti (b = 0.31, p = .001). Children in Cambodia also distributed resources between the hungry and full recipient significantly differently than children in Haiti (b = 0.36, p < .001). When comparing the distribution of sharing between a hungry and a full recipient in just Cambodia (M = 0.75, SD = 2.14) and Bolivia (M = 0.69, SD = 1.99), there was no difference in how children in these two countries shared (b = 0.06, p = .610). Rather, these country-level differences were driven by greater favoring of the hungry relative to the full recipient by children in Bolivia (b = -0.31, p < .001) and Cambodia (b = -0.37, p < .001) relative to Haiti (M = 0.38, SD = 1.59), though it is

worth noting that children across all three countries share more with the hungry than the full recipient.

The main effects of hunger, income area, two-way and three-way interactions were not significant (*ps* > .139; see Table 3.3).

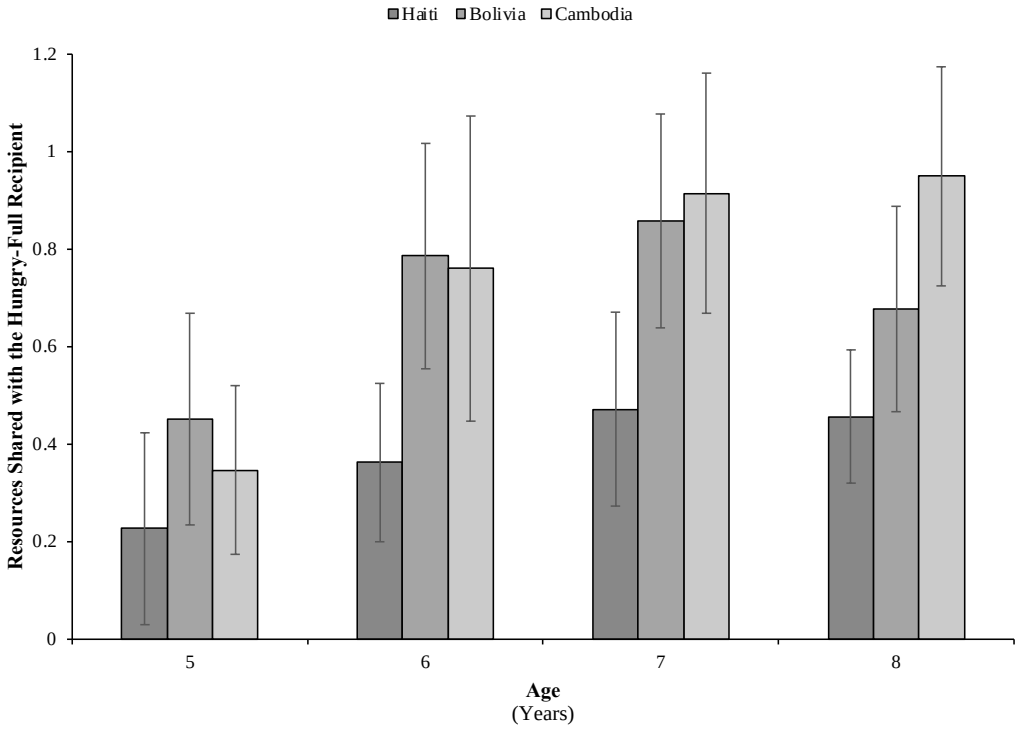
Age and Country Effects on Recipient Distributions

To further examine whether age-related increases in distributions looked similar across countries, we conducted a linear mixed-effects model examining the age x country interaction on resources shared with the hungry-full recipient. Neither the main effect of age, country, or the age x country interaction were significant in this model (*ps* > .191).

Individual models examining the effect of age on distributions of sharing with the hungry-full recipient in each country showed that favoring of the hungry over the full increased with age in Cambodia ($b = 0.19$, $p = .007$), but not in Bolivia or Haiti (*ps* > .076; see Figure 3.2).

Figure 3.2

Difference Score of Resources Shared (Pooled) with the Hungry-Full Recipient by Age and Country



Note: Error bars reflect the 95% confidence interval.

Sharing Resources with the Hungry Recipient

Since scores of zero do not differentiate between non-sharers and equal sharers, we examined the effects of hunger, income, resource, and their interactions, along with age and country, on just the number of resources shared with the hungry recipient. Doing so allowed us to examine whether lunch or income led to increased sharing with the hungry recipient specifically, due to a match in need state, which the examination of sharing by the difference score alone could not capture.

As in the difference score models, there was a main effect of resource (b = -0.27, p = .002), reflecting greater sharing of candies than stickers with the hungry recipient, and of age (b =

0.17, $p < .001$), reflecting greater sharing with the hungry recipient with age. There were also main effects of country, such that children in Bolivia shared significantly differently with the hungry recipient relative to children from Haiti ($b = 0.89$, $p < .001$), and children in Cambodia shared significantly differently relative to children from Haiti ($b = 0.85$, $p < .001$). These effects were driven by children in Haiti sharing less with the hungry recipient ($M = 0.80$, $SD = 1.36$) than children in Bolivia ($M = 1.69$, $SD = 1.64$; $b = -0.90$, $p < .001$) and Cambodia ($M = 1.66$, $SD = 1.76$; $b = -0.86$, $p < .001$). Children in Bolivia and Cambodia shared similarly with the hungry recipient ($b = -0.04$, $p = .708$).

The main effects of hunger and income and the two-way and three-way interactions were not significant in the model ($ps > .220$).

Executive Functioning and Empathy

To determine whether age-related differences in children's sharing behavior across countries is associated with differences in executive functioning or empathy, we conducted a series of linear mixed-effects models to look at age-related changes and country-level differences in these measures. Children participated in cool and hot executive functioning and empathy tasks twice (once in each session), resulting in 1,836 observations of each measure in our analysis sample. Subject was modelled as the random intercept in these models.

Cool Executive Functioning

We examined the effect of age, country, and the age x country interaction in predicting cool executive functioning scores to see if age-related differences in sharing by country could be explained by age-related differences in cool executive functioning abilities by country.

There was a main effect of age ($b = 1.59$, $p < .001$), such that cool executive functioning (EF) scores increased with age across countries. There was also a main effect of country. Children

in Cambodia significantly differed in cool EF relative to children in Haiti (b = -6.53, p < .001). Children in Bolivia did not significantly differ in cool EF relative to children in Haiti (b = -1.64, p = .394). The age x country interaction was not significant (p > .064).

Children from Cambodia had the lowest cool EF scores (M = 23.30, SD = 5.71) relative to children in Bolivia (M = 24.57, SD = 5.16) and Haiti (M = 26.16, SD = 4.94). When examining country to country comparisons on subsets of the data, we see that children from all three countries performed significantly differently in cool EF (cool EF in Cambodia versus Bolivia, b = -1.26, p < .001; cool EF in Cambodia versus Haiti, b = 2.85, p < .001; cool EF in Bolivia versus Haiti b = 1.59, p < .001).

Although average cool EF scores differed between countries, similar age-related increases in cool executive functioning were present in each country. In a series of models looking at the effect of just age within each country alone, we find that age-related increases in cool EF were present in Bolivia (b = 1.59, p < .001), Cambodia (b = 2.13, p < .001), and Haiti (b = 1.59, p < .001).

This pattern of results suggests that country level differences in children's sharing by age across Bolivia, Cambodia, and Haiti are likely not the result of differences in cool EF since children in Haiti did not show age-related increases in sharing but did show age-related increases in cool EF. Furthermore, children in Haiti shared significantly less than children in both Cambodia and Bolivia, but children in Cambodia had lower cool EF scores than children in both Bolivia and Haiti. These results indicate that cool executive functioning abilities are not sufficient to explain cross-cultural differences in sharing behavior.

Hot Executive Functioning

We examined the effect of age, country, and the age x country interaction in predicting hot executive functioning scores.

There was a main effect of age (b = 0.44, p < .001), such that children exhibited greater hot executive functioning (EF) with age. There was also a main effect of country such that hot EF scores significantly differed when comparing children in Bolivia relative to Haiti (b = 2.38, p = .001). Children in Cambodia did not significantly differ in hot EF relative to children in Haiti (b = 0.76, p = .313). These findings were qualified by a significant age x country interaction, when comparing children in Bolivia relative to Haiti (b = -0.37, p = .001), but the age x country interaction, when comparing children in Cambodia relative to Haiti, was not significant (b = -0.17, p = .142).

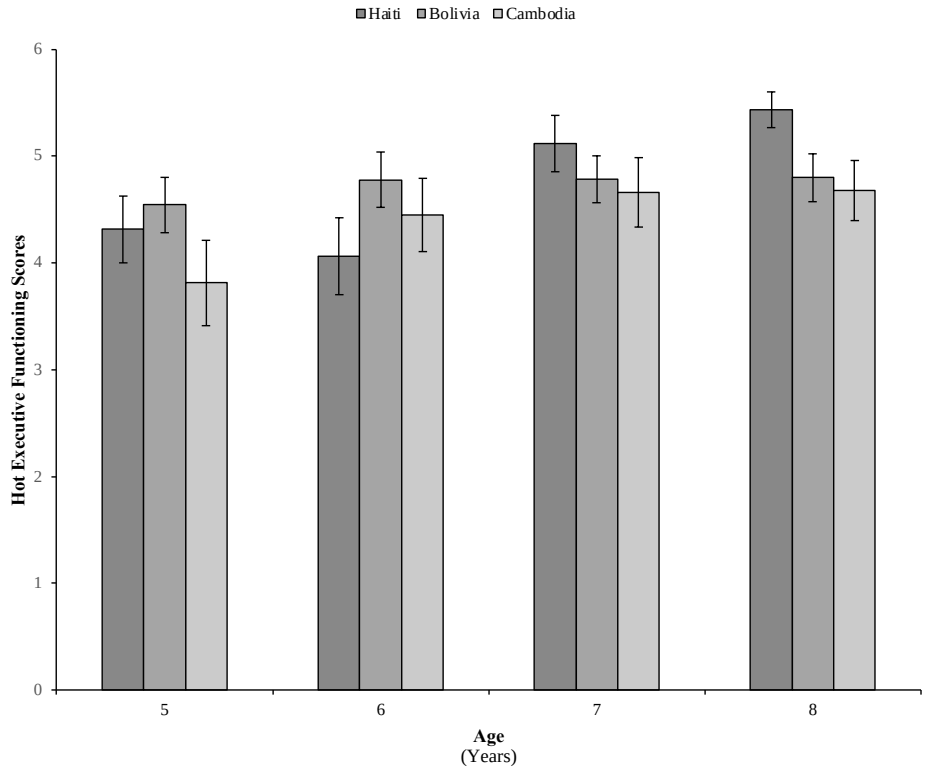
These interaction effects reflect the fact that children in Cambodia and Haiti had similar age-related increases in hot EF but children in Bolivia did not. When examining the country-by-country comparisons, children from Cambodia (M = 4.41, SD = 2.11) significantly differed in hot EF overall relative to children in Bolivia (M = 4.73, SD = 1.53; b = -0.32, p = .014) and Haiti (M = 4.73, SD = 1.91; b = 0.31, p = .030), but both children in Cambodia and Haiti exhibited age-related increases in hot EF (age on hot EF for children in Cambodia, b = 0.27, p = .004, and children in Haiti b = 0.44, p < .001). Although children in Bolivia and Haiti did not differ in overall hot EF (b = -0.00, p = .978), the age-related pattern for children in these countries was distinct. Even very young children in Bolivia had high hot EF scores and there was no effect of age on hot EF scores in Bolivia (b = 0.08, p = .228), while there were age-related increases in hot EF in children in Haiti (see Figure 3.3).

Although hot EF might contribute to sharing behavior, it is unlikely that age-related differences in sharing by country are due to different developmental trajectories of hot EF across

countries, given that children in Cambodia and Haiti exhibited similar age-related increases in hot EF while children in Bolivia did not, but children in Bolivia and Cambodia exhibited similar age-related increases in sharing while children in Haiti did not.

Figure 3.3

Age-Related Changes in Hot Executive Functioning Scores by Country



Notes: Higher hot executive functioning scores reflect greater delay-of-gratification. Error bars reflect the 95% confidence interval.

Empathy

We examined the effect of age, country, and the age x country interaction in predicting empathy scores, to see if age-related differences in favoring the hungry over the full recipient and country-level differences in favoring the hungry over the full recipient were associated with

different age-related patterns of empathy in these countries, as empathy might predict compassion and prosociality towards others in need.

There was a main effect of age, such that children showed greater empathy as they got older (b = 5.00, p < .001). There was also a main effect of country, such that children in Bolivia exhibited a different pattern of empathy scores than children in Haiti (b = 12.58, p = .011) and children in Cambodia exhibited a different pattern of empathy scores than children in Haiti (b = 29.87, p < .001). These effects were qualified by significant country x age interactions. Both the age x country interaction when comparing children in Bolivia relative to Haiti (b = -1.88, p = .012), and the age x country interaction when comparing children in Cambodia relative to Haiti (b = -4.27, p < .001) were significant.

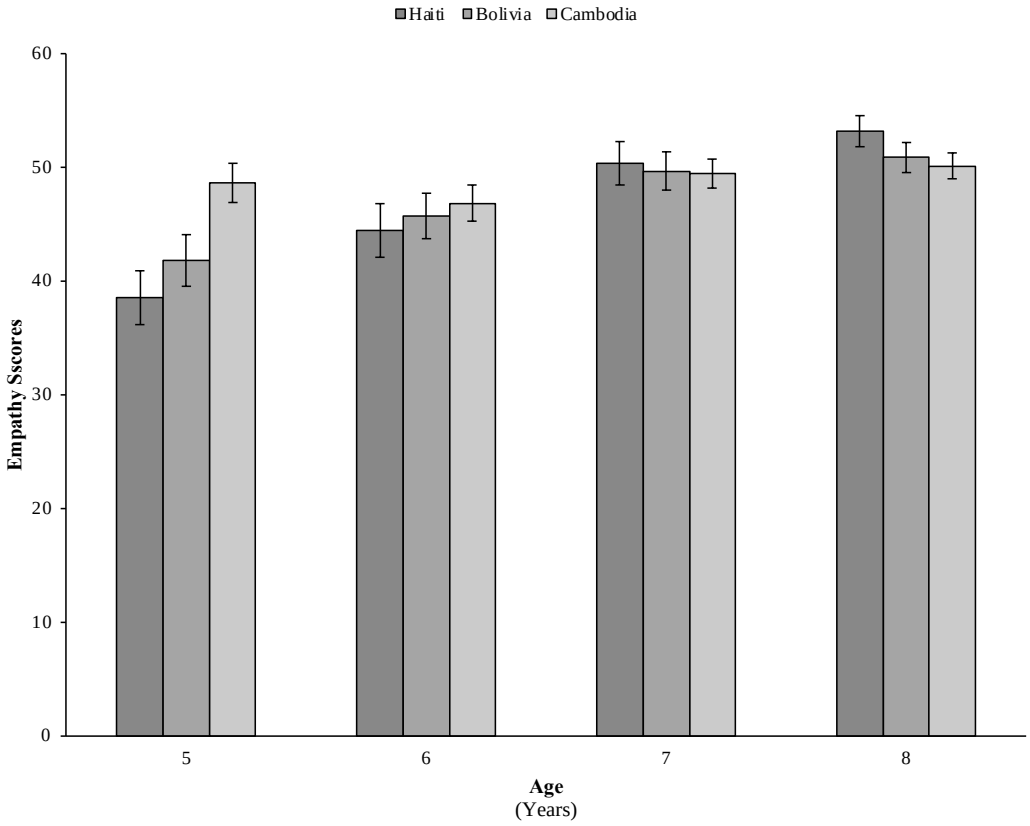
As illustrated in Figure 3.4, these interactions reflect the fact that empathy scores increase with age in Haiti and Bolivia, but not in Cambodia. Children in Cambodia had the highest empathy scores on average (M = 48.77, SD = 9.02), and significantly differed in average empathy ratings overall compared to children in both Bolivia (M = 47.02, SD = 12.33, b = 1.74, p = .031) and Haiti (M = 46.57, SD = 14.23, b = -2.20, p = .015). Even very young children in Cambodia had high empathy scores, leading to the highest empathy scores on average across countries, but children in Cambodia did not exhibit age-related increases in empathy (b = 0.73, p = .083), unlike children in Haiti (b = 5.00, p < .001) and Bolivia (b = 3.12, p < .001). Children in Haiti and Bolivia did not differ in empathy scores overall (b = -0.46, p = .641; see Figure 3.4).

Given that children in Haiti exhibited age-related increases in empathy but exhibited less favoring of the hungry over the full recipient with age relative to children in Bolivia and Cambodia, as well as less sharing with the hungry recipient alone, it is unlikely that age-related country differences in recipient sharing decisions are driven by different developmental

trajectories of empathy across countries. Furthermore, children in Cambodia demonstrated age-related increases in favoring the hungry over the full recipient, unlike children in Bolivia and Haiti, but did *not* demonstrate age-related increases in empathy.

Figure 3.4

Age-Related Changes in Empathy Scores by Country



Notes: Higher empathy scores reflect children feeling sorrier for other children in pain. Error bars reflect the 95% confidence interval.

Analyses of Executive Functioning and Empathy by Hunger and Income Area

Our interest in examining executive functioning and empathy was to understand how these measures related to age-related differences in sharing behavior and equity concerns by country,

given past work linking these abilities with aspects of prosociality (e.g., Cowell et al., 2017; Spinrad & Gal, 2018). Although hunger and income area did not influence sharing behavior in our analyses, we conducted exploratory analyses to determine if EF and empathy scores differed by hunger and income area.

In a linear mixed-effects model examining the role of hunger in predicting cool EF, there was a main effect of hunger (b = -0.64, p < .001), such that children scored higher on the cool EF task before lunch (M = 25.02, SD = 5.36) than after lunch (M = 24.39, SD = 5.41). However, hunger did not influence hot EF scores (b = -0.03, p = .574) or empathy (b = 0.10, p = .742).

In a linear mixed-effects model examining the role of income area in predicting cool EF, there was a main effect of income area on cool EF scores (b = 1.39, p < .001), such that children in higher income areas (M = 25.39, SD = 5.08) scored higher on the cool EF task than lower income areas (M = 24.00, SD = 5.61). There was no effect of income area on hot EF scores (b = 0.11, p = .306) or empathy (b = 0.65, p = .374).

3.3 Discussion

Overall, we find consistent effects of age, country, and resource on sharing decisions and equity-based distributions. While it was predicted that environmental features – specifically hunger and income – would also affect sharing decisions and equity-based distributions, we do not find this to be the case. It was predicted that hunger could either reduce sharing (i.e., Huppert et al., 2020; Xu et al., 2015), particularly of relevant food resources, or increase sharing, especially with hungry recipients (i.e., Harel & Kogut, 2015), but hunger had no effect on the number of resources shared overall or shared with just the hungry recipient. It was also predicted that the effect of hunger on sharing might be influenced by the overall income level of the child's neighborhood. Contrary to our hypotheses, we find no effect of neighborhood income on the

number of resources shared overall or shared with just the hungry recipient. The interactions between hunger and income on sharing decisions were also insignificant.

A consistent effect of resource emerged, but the nature of this effect was contrary to our predictions. We had thought that hunger might interact with resource, such that hunger might reduce sharing of candies if children wanted to eat before lunch, or alternatively, might motivate greater sharing of candies in hungrier children, if a match between child need and recipient need motivated sharing relevant – valued – resources. Yet, we find no interaction between hunger and resource nor between income and resource. Rather, children were more likely to share candies than stickers regardless of their own hunger or income level. Children also favored the hungry over the full recipient to a greater extent when sharing candies than stickers. In this case, the motivation to share, particularly with a recipient described as experiencing a need that could be rectified by the specific resource, may have outweighed the desire to offset one's own hunger and made the child's own need less relevant to the sharing decision. Children took the social context, including the recipient's welfare and value of the resource, into account in their decision of whether to share or keep resources, rather than basing their decisions solely on their own resource levels and current need. As argued in a recent review on hunger (Faber & Häusser, 2022), the social situation is likely to dictate whether hunger increases or decreases prosociality. Previous research on hunger, income, and prosocial behavior might have produced inconclusive results because of idiosyncrasies in the broader social context of these decisions. In this case, when children had a resource to share that was valuable to a hungry recipient, there was no effect of hunger, but it is possible that hungry children would have shared less if one of the recipients was not described as hungry. Consistent with this argument, previous work finding a negative effect of scarcity on children's sharing has looked at anonymous recipients (i.e., Huppert et al., 2020; Safra

et al., 2016; Benenson et al., 2007). During experiences of scarcity, children may be motivated to prioritize their own need when a recipient's need is unknown, but not when they are aware that the recipient is also in need. Therefore, rather than exerting a global effect on prosocial motives, scarcity may have differential effects that are context dependent.

Children in Bolivia, Cambodia, and Haiti showed similarities in their greater willingness to share candies over stickers and in favoring of the hungry over the full recipient; however, cross-cultural differences in sharing did emerge. Children in Cambodia and Bolivia exhibited the predicted age-related increase in the number of resources shared (e.g., Benenson et al., 2007; Gummerum et al., 2010), but children in Haiti did not. A clear environmental difference between these three countries is that children from Haiti came from poorer environments overall (see Table 3.1). Therefore country-level effects might be indexing effects of more chronic resource shortage, which could lead to decreased sharing. If chronic resource shortage and environmental harshness decrease overall sharing, then we might have expected these children to perform worse on executive functioning tasks, given past research linking harsh environments with lower delay-of-gratification and greater present-orientation (Pepper & Nettle, 2017; Frankenhuis et al., 2016). Even though children in Haiti did not show age-related increases in sharing, they did show age-related increases in hot and cool executive functioning. Since the predicted age-related increases in these abilities, consistent with past research (i.e., Hongwanishkul et al., 2005), were present for children in Haiti, we cannot adequately explain reduced sharing by differences in these specific cognitive abilities. Instead, other social factors related to harsher environments may contribute to decreased sharing. For example, the expectation to give away resources might be different in a country experiencing greater poverty or scarcity, altering fairness norms.

Although children exhibited cross-country differences in the number of resources shared, children from all three countries were more likely to share with a hungry over a full recipient with age. These results are consistent with past developmental work showing that children increasingly approve of unequal distributions that alleviate need between ages five to eight (i.e., Schmidt et al., 2016; Huppert et al., 2019). Additionally, children from all three countries favored the hungry recipient more when sharing candies, illustrating greater willingness to deviate from equality when resources were relevant to the pre-existing inequality. Although this pattern of favoring the hungry over the full recipient was consistent across countries, the extent to which children from Haiti favored the hungry over the full recipient was lower relative to children from Bolivia and Cambodia. Children from Bolivia showed a high degree of favoring the hungry over the full recipient but did not show age-related increases in their willingness to favor the hungry over the full, whereas children in Cambodia did show age-related increases in their willingness to favor the hungry over the full recipient. Interestingly, younger children in Bolivia, the richest country in our sample, showed an earlier preference for equity in this context, and children from Haiti, the poorest country in our sample, exhibited less favoring of the hungry over the full recipient. It is possible that the overall wealth of these countries influences views of the full recipient being "full," if being full in a poorer country has a different connotation than in a wealthier country. For example, if being full is seen as more temporary in Haiti, then children in Haiti might want to make sure the full recipient still receives some resources, even while favoring the hungry. Conversely, children from Bolivia may be less concerned about the full recipient, if this is viewed as indicative of general food access and more stable, and these children may be especially motivated to share more with the hungry. Asking children about the justification for their

distributions in future work can add insight into this theory and help explain disparate resource allocation decisions.

While this study highlights the role of recipient need and resource value in predicting sharing and fairness preferences, there are also limitations in our ability to conclude more. Children might have chosen to share more candies than stickers because they prioritized offsetting the hungry recipient's need, as we have argued, but it is also possible children just valued the candies less than stickers. The experimenters in each country confirmed liking of the resources with a binary question (see Appendix Q), but since children said they liked both resources, we cannot directly compare liking levels of the two resources. Future studies could quantify resource value in a more fine-grained manner and consider the degree to which resource value predicts sharing decisions with a recipient in need.

Likewise, additional research should directly measure perceptions of socioeconomic status at the individual level. We verified our hunger manipulation at the individual level, but our income manipulation was based on overall neighborhood income levels. It is possible that children are less aware of their neighborhood income level than adults. Assessing individual socioeconomic status might yield different results relative to this neighborhood level income factor.

Our exploratory findings on executive functioning also raise new questions about the role of hunger in social decision-making. Children from lower income areas exhibited decreased cool EF scores relative to children in higher income areas, which is consistent with past developmental work (Raver et al., 2013). Children also exhibited decreased cool EF scores *after* lunch relative to before lunch. These results are surprising, since we might expect feeling satiated to enhance rather than reduce cognitive control. Research on self-regulation in adults suggests that reductions in

glucose may underly aspects of self-regulatory failure (e.g., Gailliot et al., 2007). It is possible that any hunger effects would need to be longer lasting to see decreases in cool EF, but this is an open question.

Though questions remain, this work adds insight into the development of sharing behavior and equity concerns by highlighting the importance of diverse aspects of social context – including resource type, recipient need, and country – in shaping these decisions. In the current study, social considerations outweighed children's concern with fulfilling their own need. This result helps address contradictory theories regarding the effects of resource scarcity on prosociality by suggesting that scarcity may operate differently based on resource value and recipient need. Overall, these results shed light on the importance of the social decision context on the development of sharing behavior and equity concerns in middle childhood.

3.4 Appendix P: Manipulation Check of Hunger by Country

As mentioned in the main manuscript, children self-reported hunger using a 6-point Likert type scale at the start of each testing session (*1 = not at all hungry, 6 = very hungry*) and children reported being significantly hungrier before lunch compared to after lunch. We conducted a series of one-way ANOVAs to determine whether self-reported hunger varied by time of testing in each country alone. The same trend was observed in each country when examining the effect of lunch time on self-reported hunger in each country alone: Bolivia, $F(1, 1250) = 1040.62$, $p < .001$, $\eta_p^2 = .45$; Cambodia, $F(1, 1166) = 302.99$, $p < .001$, $\eta_p^2 = .21$; Haiti, $F(1, 1250) = 128.51$, $p < .001$, $\eta_p^2 = .09$. These results indicate that the acute hunger manipulation was successful and operated similarly across the three countries.

3.5 Appendix Q: Study Materials

We include scripts and scales for all recorded measures below. Materials were prepared by the Child Neurosuite in Chicago, IL and distributed to researchers in Bolivia, Cambodia, and Haiti in English. These English materials were used for training sessions. Experimenters in each country translated the materials into the local language of the children for the testing sessions.

Hunger Script:

Experimenter: "I would like to know how hungry you are right now. *Ideally the child understands the concept of hunger, in some five year olds this may not be the case. If the child does not understand the word "hunger" your two alternatives are: did you eat today? Are you feeling pain in your belly because you haven't eaten- how much pain?*

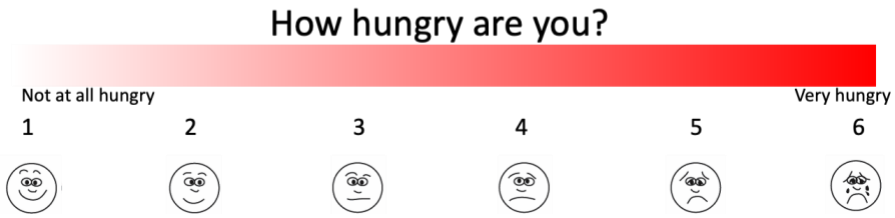
Please explain how the scale works and what the faces indicate. Practice with the children before asking their hunger level. Please note that the numbers below the faces are meant for the student-testers **only**. *The child only needs to point to a face not a number! But you, the student-tester, must record a number for the excel spreadsheet. If the child just does not understand how to use the 6-smiley/frowning face scale, you may instead ask a binary question ("Are you not at all hungry or very hungry?") and record a 1 or a 6, respectively.*

Record hunger: _____ *(1=not at all hungry, 6=very hungry)*

"Great job! Let's play our first game!"

Hunger Manipulation Check

State Hunger Scale



Sharing Script:

Experimenter: "Now we are going to play a game with some stickers [candies]!"

If playing the sticker trial, "Will you please pick out 6 stickers you really like?" *Empty bag of 20 stickers and allow child to select 6 stickers that he/she really likes for the game.*

If playing with candies, place 6 candies in front of child.

"Great! These are your stickers [candies] for you to keep**.** *Put 6 stickers/candies in a row in front of the child.* Do you like your stickers [candies]? *Wait for child to affirm* Great! Now we are ready to play the game!"

"I only have time today to give stickers [candies] to some of the girls and boys who play games with me today. I won't be able to give stickers [candies] to everyone. In this game, you get to decide how many of your stickers [candies] you want to keep, and how many of your stickers [candies] you want to give to other little girls or boys from your school who do not get any stickers [candies].You do not have to give any of your stickers [candies] away, but if you want to give some or all of your stickers [candies] away, you can."

“Do you have any questions? You do not have to give away any of your stickers [candies]. It is your choice. If you decide to give some stickers [candies] away to someone else in your class, I will not know who gets them and you won't know either. You can do whatever you want, it is up to you. You can take home as many stickers [candies] as you want."

"Any stickers [candies] you are going to keep, you will put them in your envelope here." *(point to the envelope with the child's name written on it next to the child)*

*"*This little boy/girl is famished/hungry. Any stickers [candies] you want to give to this little boy/girl here, you can put in this envelope." *(point to "hungry" little boy/girl-skinny stick figure and blank envelope/box next to that hungry boy/girl)*

"This little boy/girl just ate a full meal. Any stickers [candies] you want to give to this little boy/girl here, you can put in this envelope." *(point to "full" little boy/girl-round stick figure and the blank envelope/box next to that full boy/girl)*

Verify: "Can you show me which envelope is your envelope?"

(Once confirmed) "That's right, this is your envelope." *(point to envelope with child's name)*.

*"*You take home the stickers [candies] in this envelope."

"Can you show me which envelope is for this classmate?" *(point to the "hungry" boy/girl; wait for child to point to correct envelope).*

(Once confirmed) "That's right, this is the envelope for that girl/boy." *(point to the blank envelope).*

"Can you show me which envelope is for this classmate?" *(point to the "full" boy/girl; wait for child to point to correct envelope).*

(Once confirmed) "That's right, this is the envelope for that girl/boy." *(point to the blank envelope).*

"Another lady will give these stickers [candies] to those boys/girls."

"I'm going to cover my eyes now while you decide how many stickers [candies] you want to keep and how many you want to give away."

(Close and cover eyes and turn away from table to give child privacy to make their choice).

*"*You can tell me when you are finished choosing."

Once child has finished choosing:

"Great job!! Here are your stickers [candies]. You get to take these stickers [candies] home. Thank you so much for playing with me today!"

<u>Cool Executive Functioning Script:</u>

Experimenter: "Now we are going to play a game called Simon Says. I am going to be Simon. When I say 'Simon Says', you must do what I say and do. If I say, 'Simon Says, raise your hands!' then you have to raise your hands *(demonstrate by raising hands too).* If you don't do what Simon says you will be out of the game."

"If I do not say 'Simon Says,' then **do not** *(make sure to emphasize the words do not in reading these instructions)* do what I say and do. So if I say only 'Raise your hands!' *(student-tester still raises hands)* do not raise your hands because I did not say 'Simon Says.' If you do what I say and do when I don't say 'Simon Says', you will also be out. OK! Let's practice!" *Complete approximately 7 practice rounds.*

Practice "Simon Says"/activation round [i.e. "Simon says touch your nose," and then touch your nose. Child should also touch nose. If child does not touch their nose, re-read instructions and ask "OK, so what should you do if I say Simon says touch your nose?"]

Practice round without the command "Simon Says"/inhibition round [i.e. "Touch your nose," and then touch your nose. Child should not touch their nose. Student-tester completes action every time, but the child should only complete if the student-tester says, 'Simon Says." If child touches his/her nose, repeat directions and redo trial.]

Practice question, "So when I say, 'Simon Says,' do you do what I say and what I do? And when I don't say 'Simon Says,' do you do what I say and what I do?"

Pre-set instructions and coding matrix:

Research assistants coded actions during the Simon Says game using this matrix. The first column indicates the action to perform. The second column indicates whether the round is an activation round (the action is a "Simon Says" action that the child *should* perform) or an inhibition round (the action has no leading "Simon Says" and the correct response would be to do nothing /anti-imitation). The third column is for recording the correct response, and the fourth column is for coding the child's actual response.

Practice Trials BEFORE lunch	**Simon or Anti-imitation (1=Simon, 2=anti-imitation)**	**Correct Response**	**Child Response (Use 0-3 Scale)**
Simon says touch your nose	1		
Touch your elbow	2		
Touch your shoulder	2		
Simon says touch your leg	1		
Simon says raise one knee in the air	1		
Touch your head	2		
Cover your mouth	2		
Trials BEFORE lunch	**Simon or Anti-imitation (1=Simon, 2=anti-imitation)**	**Correct Response**	**Child Response (Use 0-3 Scale)**
1. Simon says crouch down	1		
2. Simon says raise one arm	1		
3. Spin/turn around	2		
4. Touch your forehead	2		
5. Simon says touch your feet	1		
6. Stomp your feet	2		
7. Clap your hands	2		
8. Simon says touch your ears	1		
9. Shake your head	2		
10. Simon says touch your knees	1		
Total Test Trials (0=30)			

Practice Trials BEFORE lunch	**Simon or Anti-imitation (1=Simon, 2=anti-imitation)**	**Correct Response**	**Child Response (Use 0-3 Scale)**
1. Simon says touch your nose	1		
2. Touch your elbow	2		
3. Touch your shoulder	2		
4. Simon says touch your leg	1		
5. Simon says raise one knee in the air	1		
6. Touch your head	2		
7. Cover your mouth	2		
Trials AFTER lunch	**Simon or Anti-imitation (1=Simon, 2=anti-imitation)**	**Correct Response**	**Child Response (Use 0-3 Scale)**
1. Simon says crouch down	1		
2. Simon says raise one arm	1		
3. Spin/turn around	2		
4. Touch your forehead	2		
5. Simon says touch your feet	1		
6. Stomp your feet	2		
7. Clap your hands	2		
8. Simon says touch your ears	1		
9. Shake your head	2		
10. Simon says touch your knees	1		
Total Test Trials (0=30)			

Hot Executive Functioning Script:

Experimenter: "We are going to play another game with stickers and candies. You will be able to choose whether you want stickers or candies now or at the end of the game. If you choose to take a sticker now, you can put the sticker on your sticker card now. Here, you can have one now!"

(give child a sticker card for the game and a sticker to place on card)

"If you choose to wait until the end of the game for your stickers, we will put the stickers in this envelope/box for later."

(point to envelope/box for stickers for the end of the game)

"If you choose to take a candy now, you can go ahead and eat the candy. Here, you can have one to try!"

(give child candy to eat).

*"*If you choose to wait until the end of the game for your candies, we will put the candies in this bag/envelope for later."

(point to bag/envelope for candies for the end of the game).

*"*You can watch me go first!"

Picks up card from card stack. Note that the first two trials are demonstration trials. Position the 1 vs. 2 candies and 1 vs. 4 stickers cards at the top of the pile for your demonstration trials. Please shuffle the cards before the 6 actual test trial rounds. 6 test trial cards should be randomized in order.

*Every time you present the card make sure the card is horizontal and floating above the boxes/piles to indicate which reward is <u>for now</u> and which is <u>for the end of the game</u>. For instance, have the 1 reward option directly above the immediate box/pile and the other option (2 candies, 4 candies, etc.) above the delayed pile. We want the cards to match up with the candies/stickers in real life! It is also very important that the **<u>immediate reward option is always the one reward option.</u>***

DEMO TRIAL 1-IMMEDIATE: *Student-tester places a bag/box for the tester and then pulls out card that says 1 versus 2 candies.*

"I can have one candy now or two candies later."

(place one candy in one "immediate" pile and two candies in another "delay" pile. Make sure the card is presented to indicate the choices as well).

"I am going to choose to eat one candy now."

(eats one candy, returns two candies to plate containing all candies for the game).

Make sure that you remain neutral in explaining the choices and making the decision. Do not let your tone of voice imply that one decision is better than another (i.e. it is better to wait).

"Let's play again!!"

DEMO TRIAL 2-DELAYED: *Student-tester pulls out card that says 1 versus 4 stickers.*

"I can have one sticker now or four stickers at the end of the game."

(place one sticker in one "immediate" pile and four stickers in another "delay" pile).

"I choose to have four stickers at the end of the game."

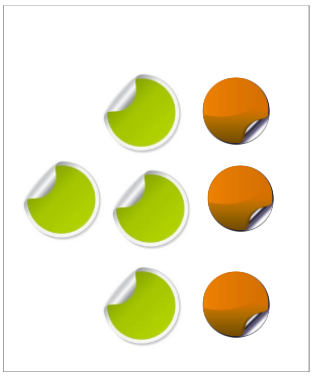
(puts four stickers in envelope for the "end of the game" rewards, places the one sticker back on original plate containing all stickers for the game).

"Ready to play?"

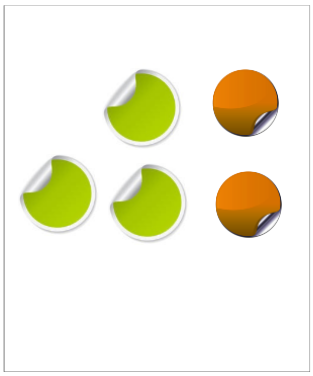
Student-tester to shuffle cards for test trials and pick one card for first test trial (repeat for six trials). Each time the student-tester selects a card, he/she reads the decision out loud and places the candies/stickers into one immediate pile and one delay pile. Then ask, "What do you want to do now?"

Hot Executive Functioning Card Stimuli

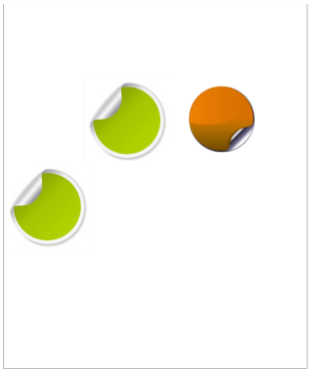
Hot executive functioning was assessed using a deck of cards, which was produced by printing the below images. Each card presents a choice between one resource for now (furthest lefthand side) or multiple resources for later (center column and righthand side column).



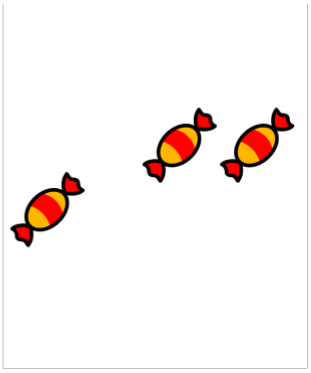
1 sticker versus 6 stickers



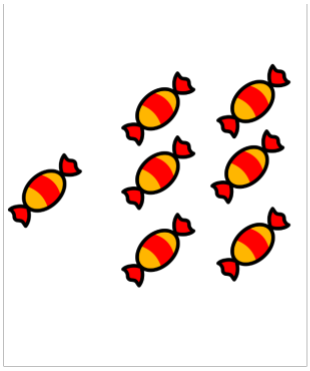
1 sticker versus 4 stickers



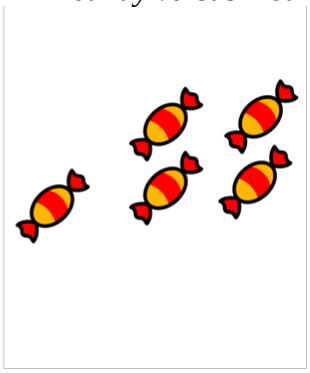
1 sticker versus 2 stickers



1 candy versus 2 candies



1 candy versus 6 candies



1 candy versus 4 candies

Notes: These images were enlarged, printed, cut, and laminated to make a stack of cards. Actual resources were also distributed next to the cards to illustrate each choice set.

Empathy task:

Empathy was assessed using a laminated booklet of ten images. The images were a series of pictures of hands and feet in painful situations (i.e., finger getting cut). Though the pictures were only of hands/feet (no facial or body features), children were told that they represented another child's hand/foot. The experimenter asked each child how sorry they felt for the child in each picture. The scale used to assess the "sorry" rating is below:

GENERAL DISCUSSION

Overall, results from three studies illustrate the importance of social context in shaping fairness considerations in middle childhood. A concern for fairness is present early in development, but at first, this is usually reflected in preferences for equality (Schmidt & Sommerville, 2011; McAuliffe et al., 2017a). Even when young children exhibit fairness concerns in their judgments and expectations, this is not always evidenced in their own behaviors, especially if they stand to gain in resources (Smith et al., 2013; Blake, 2018). However, as children get older, they are more likely to endorse fairness in their own sharing behaviors and their conceptualizations of fairness become more flexible, meaning fairness is defined differently based on factors like recipient need or resource value. Likewise, both equal and unequal distributions can be considered fair. Throughout this dissertation, I have shown that these shifts in fairness considerations occur during middle childhood (beginning around ages 5-8 years). Ultimately, I argue that variability in children's sharing behavior and fairness concerns in middle childhood are supported by an enhanced sensitivity to social cues and norms in the decision context.

These results add insight into the developmental trajectory and evolutionary function of fairness. Young children demonstrated similar intuitions about fairness across contexts. They favored equal outcomes over unequal outcomes in resource allocations where they had no stake in the distribution (Chapter 1 and 2) and were relatively selfish in their behavior when they could keep resources (Chapter 1 and 3). Early emerging concerns for fairness may be universal because of the cooperative advantage fairness confers, but manifest in self-interested ways at first (McAuliffe et al., 2017a). For example, negative reactions to having less resources than others are an advantageous response to the extent that these reactions motivate the acquisition of more

resources. The fact that both animals and very young children react poorly to receiving less valued resources than others also provides evidence that there are evolutionary origins to initial fairness concerns (i.e., Brosnan & de Waal, 2003; Blake et al., 2015a). Results from this dissertation support this theory by illustrating a similar reluctance to share and consistent preferences for equal over equitable outcomes in young children across contexts. Additionally, the asymmetry in younger children's awareness of fairness and their actual willingness to behave fairly when hungry in Chapter 1 shows that young children prioritize self-interest over fairness concerns, even when they understand fairness norms. The experience of hunger did not motivate an earlier concern with equity over equality in young children, even when equitable distributions would favor another hungry recipient with food resources (Chapter 1 and 3). This result is interesting considering work with adults, which shows that hunger promotes identification and sharing towards other hungry recipients (Harel & Kogut, 2015). The lack of hunger effects on equity preferences in young children indicates that their fairness judgments are relatively stable across contexts.

While a universal sense of fairness and employment of fairness concerns for self-interested purposes is advantageous to a certain degree, children ultimately need to demonstrate concern for others and adapt to their social context to achieve cooperative success. The optimal cooperative strategy is likely to differ across groups because of unique features in different environments (Amir & McAuliffe, 2020). Equality is not always the most productive way of thinking about fairness in modern societies characterized by large-scale coordination. Previous research has highlighted the impact of the social environment in predicting variations in cooperation in children and adults. For example, Hazda hunter-gathers, who frequently migrate between camp residences, show differences in their fairness preferences based on their current

camp of residence, rather than exhibiting fairness as a stable disposition (Smith et al., 2018). Adolescent (12-14 years-old) cliques cluster by cooperation, but importantly, clustering is driven by adaptation to cooperation norms in the group rather than partner choice (Ehlert et al., 2020). In other words, teens adapt their cooperative tendencies to match their friends and social environment of the clique more so than seeking out friends and groups with similar cooperation preferences. These studies demonstrate that fairness can be variable and learned, in part, from the social environment.

Furthermore, past work suggests that variability in prosociality starts in middle childhood and may be related to local norms. Beginning roughly between ages 5-8 years, children demonstrate increasing responsiveness to local norms and willingness to conform to adult norms of prosociality (House et al., 2020a; House et al., 2020b; House & Tomasello, 2018). My dissertation adds support to these findings by revealing variations in fairness judgments and behaviors across a range of contexts, which surfaced in the older children in my samples. Even though younger children readily endorse equality across contexts, older children in my samples preferred equitable distributions, sometimes as early as age 6, over equal distributions (Chapters 1-3), but the magnitude of the equity preference was sensitive to cultural grouping (Chapter 2) and resource value (Chapter 3), indicating variability in fairness conceptions. Furthermore, by comparing variations in sharing decisions, contextual features, and social cognitive abilities (Chapter 3), I show that age-related differences in sharing are predicted by country but not by executive functioning or empathy. Therefore, divergent sharing decisions might have been driven by differing norms between the countries. This finding lends support to the argument that an enhanced sensitivity to social norms is a key mechanism driving variability in sharing and fairness behaviors.

Highlighting this flexibly in fairness conceptions in middle childhood opens exciting new avenues for research. For example, even though children may adapt their fairness preferences to their environment in some situations, there also may be fairness preferences that do persist across environments. I found that a hungry child was less likely to share with an anonymous recipient (Chapter 1) but not less likely to share with another hungry recipient (Chapter 3), demonstrating sensitivity to the recipient's needs. It is also possible that some children will always share more with certain recipients across contexts, such as always sharing more with in-group members. Identifying situations in which older children do show stability in fairness behaviors and judgments and comparing these contexts to those in which they exhibit variability can help in understanding how children learn to internalize social norms and when they care most about conformity to norms. For example, are children more likely to demonstrate a stable fairness rule (i.e., always share more with a poor recipient) if they experienced others around them doing this frequently? If so, this might suggest observation of moral behaviors is more important than other forms of moral education in predicting children's own behaviors. Another possibility is that children are more likely to demonstrate a stable fairness rule if they experienced positive reinforcement from sharing in similar scenarios previously. Exploring factors that give rise to stability in childhood might help lay a foundation for encouraging similar behaviors in adulthood, such as charitable giving or support for fair resource distribution policy initiatives.

Future research will also benefit from examination of fairness across a longer developmental timespan and more varied contexts. Although children's equity preferences did vary in the current study (i.e., some children cared more about rectifying inequalities related to wealth than merit, Chapter 2), there was a fairly robust preference for equity over equality with age overall, across these chapters, which is also consistent with previous research (i.e., Rizzo &

Killen, 2016). Children in middle childhood frequently endorse equity over equality; yet, adults preferences do not always reflect this preference. For instance, many adults – even those with plenty - are reluctant to donate to the poor or the hungry, resist paying taxes that contribute to welfare systems, and complain about tipping service workers who have less. It is possible that there are other developmental shifts in fairness perceptions that occur after middle childhood, which might explain reduced equity preferences in adults. For example, the experience of working to earn one's resources might lead adults to place more weight on maintaining their resources than contributing to those with less. Examining the trajectory of fairness preferences from middle childhood into adulthood and considering the context of the workplace and pay distribution in such a developmental examination might add insight into this question.

Taking a broader developmental perspective can also aid in understanding how quickly people update their fairness preferences in new environments. The transition from middle childhood to adolescence to young adulthood often involves moving contexts from classroom groups to friendship cliques to workplace settings. The relative speed at which people update their preferences across different settings could be related to the weight people place on various moral values. For example, if someone frequently adjusts their donation behaviors based on how their peers donate to others, then this person might not actually care much about giving to those in need, but instead, care about aligning their behavior to prosocial norms. Alternatively, someone who is always generous regardless of their peers is likely to highly value charitable giving, regardless of local norms. Comparing the speed at which people update *different* moral behaviors across contexts might also be useful for comparing valuation between moral principles. If someone updates their donation behavior more frequently than their honesty

preferences, for example, then this might indicate that the person values honesty more strongly than charitable giving.

In addition to these future directions, these chapters are limited in that we did not directly measure children's awareness of social norms, which future research should address. Asking children about their understanding of local fairness norms is a clear way to draw firmer conclusions about the role of social norms as a mechanism promoting fairness preferences. Asking parents or teachers about fairness norms in home and school settings, and comparing adult and children's perceptions of these norms, might also be revealing to see if adults and children are operating under similar fairness norms. For example, asking parents and children about norms of equity might be useful for predicting the age at which children shift from equality to equity-based distribution strategies. It is possible that children's own behavior will shift when they demonstrate alignment in their perceptions of fairness norms and adult perceptions of these norms. In addition to asking about norm awareness, manipulating norms in the environment will be important for determining the extent to which sensitivity to social norms predicts sharing behavior (see House et al., 2020a; House et al., 2020b for examples of direct norm manipulations).

Future research could also assess variations in contextual features more directly. Resource value, recipient need, and hunger levels were directly manipulated in Chapters 1-3, but country served as a proxy for culture in Chapters 2 and 3, and neighborhood served as a proxy for income in Chapter 3. Assessing individual mindsets among participants might reveal different cultural mindsets or perceptions of socioeconomic status at the individual level that these proxy variables do not capture. It is possible that individual differences in cultural mindset or self-perceptions of status predict divergent fairness preferences in other ways.

Though many questions remain, this dissertation aids in the current understanding of the developmental trajectory of fairness preferences and sheds light on the mechanisms promoting fairness concerns in middle childhood. In three chapters, I have shown that children demonstrate similarities in aspects of their sharing behavior and fairness evaluations at a young age but exhibit context-dependent conceptions of fairness during middle childhood. Specifically, children attend to resource value and recipient need when deciding whether to share their own resources and whether to stray from equal allocations. Cultural norms also influence these behaviors in disparate ways. I argue that the ability to think of fairness flexibly is likely an advantageous skill that allows people to adapt to their environment and become effective cooperative partners. Cultivating this skill in middle childhood is critical, since this a time when children are engaging in more socialization behaviors and taking on new roles in society (Lancy, 2010; House et al., 2020a). By considering the role of context – from recipient need to cultural community – in shaping fairness preferences in middle childhood, this dissertation highlights variability in children's conceptions of fairness across disparate environments and sheds light on sensitivity to social norms as a mechanism promoting flexible fairness concerns.

References

Aarøe, L., & Petersen, M. B. (2013). Hunger games: Fluctuations in blood glucose levels influence support for social welfare. *Psychological Science, 24*(12), 2550-2556.

Abrams, D., Van de Vyver, J., Pelletier, J., & Cameron, L. (2015). Children's prosocial behavioural intentions towards outgroup members. *British Journal of Developmental Psychology, 33*(3), 277-294.

Adams, J. S. (1965). Inequity in social exchange. In *Advances in experimental social psychology* (Vol. 2, pp. 267-299). Academic Press.

Almås, I., Cappelen, A. W., Sørensen, E. Ø., & Tungodden, B. (2010). Fairness and the development of inequality acceptance. *Science, 328*(5982), 1176-1178.

Almås, I., Cappelen, A. W., & Tungodden, B. (2016). Cutthroat capitalism versus cuddly socialism: Are Americans more meritocratic and efficiency-seeking than Scandinavians? NHH Norwegians School of Economics, Working Paper No. 18/2016.

Amir, D., & McAuliffe, K. (2020). Cross-cultural, developmental psychology: Integrating approaches and key insights. *Evolution and Human Behavior*, *41*(5), 430-444.

Barragan, R. C., Brooks, R., & Meltzoff, A. N. (2020). Altruistic food sharing behavior by human infants after a hunger manipulation. *Scientific Reports*, *10*(1), 1-9.

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using lme4. *Journal of Statistical Software*, *67*(1), 1–48.

Baumard, N., Mascaro, O., & Chevallier, C. (2012). Preschoolers are able to take merit into account when distributing goods. *Developmental Psychology*, *48*(2), 492-498.

Baumard, N., André, J. B., & Sperber, D. (2013). A mutualistic approach to morality: The evolution of fairness by partner choice. *Behavioral and Brain Sciences, 36*(1), 59-78.

Benenson, J. F., Pascoe, J. & Radmore, N. (2007). Children's altruistic behavior in the dictator game. *Evolution and Human Behavior*, *28*(3), 168-175.

Bennett, C. & Blissett, J. (2014). Measuring hunger and satiety in primary school children. Validation of a new picture rating scale. *Appetite, 78*, 40–48.

Benozio, A., & Diesendruck, G. (2015). Parochialism in preschool boys' resource allocation. *Evolution and Human Behavior*, *36*(4), 256-264.

Berry, J. W. (1971). Ecological and cultural factors in spatial perceptual development. *Canadian Journal of Behavioural Science/Revue Canadienne des Sciences du Comportement*, *3*(4), 324-336.

Blake, P. R., & McAuliffe, K. (2011). “I had so much it didn’t seem fair”: Eight-year-olds reject two forms of inequity. *Cognition, 120*(2), 215-224.

Blake, P. R., McAuliffe, K., & Warneken, F. (2014). The developmental origins of fairness: The knowledge–behavior gap. *Trends in Cognitive Sciences, 18*(11), 559-561.

Blake, P. R., McAuliffe, K., Corbit, J., Callaghan, T. C., Barry, O., Bowie, A., ... & Wrangham, R. (2015a). The ontogeny of fairness in seven societies. *Nature*, *528*(7581), 258-261.

Blake, P. R., Piovesan, M., Montinari, N., Warneken, F., & Gino, F. (2015b). Prosocial norms in the classroom: The role of self-regulation in following norms of giving. *Journal of Economic Behavior & Organization, 115*, 18-29.

Blake, P. R. (2018). Giving what one should: explanations for the knowledge-behavior gap for altruistic giving. *Current Opinion in Psychology, 20,* 1-5.

Bräuer, J., & Hanus, D. (2012). Fairness in non-human primates? *Social Justice Research*, *25*(3), 256-276.

Briers, B., Pandelaere, M., Dewitte, S., & Warlop, L. (2006). Hungry for money: The desire for caloric resources increases the desire for financial resources and vice versa. *Psychological Science*, *17*(11), 939-943.

Brosnan, S. F., & de Waal, F. B. M. (2003). Monkeys reject unequal pay. *Nature*, *425*(6955), 297-299.

Brosnan, S. F., & de Waal, F. B. M. (2014). Evolution of responses to (un)fairness. *Science*, *346*(6207), 1251776.

Bryan, C. J., Tipton, E., & Yeager, D. S. (2021). Behavioural science is unlikely to change the world without a heterogeneity revolution. *Nature Human Behaviour*, *5*(8), 980-989.

Burford, H. C., Foley, L. A., Rollins, P. G., & Rosario, K. S. (1996). Gender differences in preschoolers' sharing behavior. *Journal of Social Behavior and Personality, 11*(5), 17-25.

Callaghan, T., & Corbit, J. (2018). Early prosocial development across cultures. *Current Opinion in Psychology*, *20*, 102-106.

Cameron, L., Erkal, N., Gangadharan, L., & Meng, X. (2013). Little emperors: behavioral impacts of China's One-Child Policy. *Science*, *339*(6122), 953-957.

Cappelen, A. W., List, J., Samek, A., & Tungodden, B. (2017). *The effect of early education on social preferences*. NBER Working Paper No. 22898.

Charafeddine, R., Mercier, H., Clément, F., Kaufmann, L., Berchtold, A., Reboul, A., & Van der Henst, J. B. (2015). How preschoolers use cues of dominance to make sense of their social environment. *Journal of Cognition and Development*, *16*(4), 587-607.

Charafeddine, R., Mercier, H., Clément, F., Kaufmann, L., Reboul, A., & Van der Henst, J. B. (2016). Children's allocation of resources in social dominance situations. *Developmental Psychology, 52*(11), 1843.

Chen, Y., Zhu, L., & Chen, Z. (2013). Family income affects children's altruistic behavior in the dictator game. *PLoS One, 8*, e80419.

Chernyak, N., & Kushnir, T. (2013). Giving preschoolers choice increases sharing behavior. *Psychological Science*, *24*(10), 1971-1979.

Chernyak, N., Sandham, B., Harris, P. L., & Cordes, S. (2016). Numerical cognition explains age-related changes in third-party fairness. *Developmental Psychology*, *52*(10), 1555-1562.

Choshen-Hillel, S., Lin, Z., & Shaw, A. (2020). Children weigh equity and efficiency in making allocation decisions: Evidence from the US, Israel, and China. *Journal of Economic Behavior & Organization*, *179*, 702-714.

Chudek, M., & Henrich, J. (2011). Culture–gene coevolution, norm-psychology and the emergence of human prosociality. *Trends in Cognitive Sciences*, *15*(5), 218-226.

Cialdini, R. B., Wosinska, W., Barrett, D. W., Butner, J., & Gornik-Durose, M. (1999). Compliance with a request in two cultures: The differential influence of social proof and commitment/consistency on collectivists and individualists. *Personality and Social Psychology Bulletin*, *25*(10), 1242-1253.

Cowell, J. M., & Decety, J. (2015). Precursors to morality in development as a complex interplay between neural, socioenvironmental, and behavioral facets. *Proceedings of the National Academy of Sciences*, *112*(41), 12657-12662.

Cowell, J. M., Lee, K., Malcolm-Smith, S., Selcuk, B., Zhou, X., & Decety, J. (2017). The development of generosity and moral cognition across five cultures. *Developmental Science*, *20*(4), e12403.

Damon, W. (1977). *The social world of the child*. San Francisco, CA: Jossey-Bass.

Danziger, S., Levav, J., & Avnaim-Pesso, L. (2011). Extraneous factors in judicial decisions. *Proceedings of the National Academy of Sciences*, *108*(17), 6889-6892.

Dawes, C. T., Fowler, J. H., Johnson, T., McElreath, R., & Smirnov, O. (2007). Egalitarian motives in humans. *Nature*, *446*(7137), 794-796.

Decety, J., Michalska, K. J., & Akitsuki, Y. (2008). Who caused the pain? An fMRI investigation of empathy and intentionality in children. *Neuropsychologia*, *46*(11), 2607-2614.

Decety, J. (2010). The neurodevelopment of empathy in humans. *Developmental Neuroscience, 32*(4), 257-267.

Decety, J., & Svetlova, M. (2012). Putting together phylogenetic and ontogenetic perspectives on empathy. *Developmental Cognitive Neuroscience*, *2*(1), 1-24.

Decety, J., & Cowell, J. M. (2014). Friends or foes: Is empathy necessary for moral behavior? *Perspectives on Psychological Science*, *9*(5), 525-537.

Decety, J., Bartal, I. B. A., Uzefovsky, F., & Knafo-Noam, A. (2016). Empathy as a driver of prosocial behaviour: highly conserved neurobehavioural mechanisms across species. *Philosophical Transactions of the Royal Society B: Biological Sciences, 371*(1686), 20150077.

Decety, J., & Yoder, K. J. (2017). The emerging social neuroscience of justice motivation. *Trends in Cognitive Science, 21*(1), 6–14.

Decety, J., & Cowell, J. M. (2018). Interpersonal harm aversion as a necessary foundation for morality: A developmental neuroscience perspective. *Development and Psychopathology*, *30*(1), 153-164.

Decety, J. Meidenbauer, K. L., & Cowell, J. M. (2018). The development of cognitive empathy and concern in preschool children: A behavioral neuroscience investigation. *Developmental Science*, e12570.

Deutsch, M. (1975). Equity, equality, and need: What determines which value will be used as the basis of distributive justice? *Journal of Social Issues*, *31*(3), 137-149.

Dunfield, K. A., Kuhlmeier, V. A., & Murphy, L. (2013). Children's use of communicative intent in the selection of cooperative partners. *PloS One*, *8*(4), e61804.

Ehlert, A., Kindschi, M., Algesheimer, R., & Rauhut, H. (2020). Human social preferences cluster and spread in the field. *Proceedings of the National Academy of Sciences*, *117*(37), 22787-22792.

Eisenberg, N., & Miller, P. A. (1987). The relation of empathy to prosocial and related behaviors. *Psychological Bulletin*, *101*(1), 91-119.

Elder Jr., G. H., King, V., & Conger, R.D. (1996). Intergenerational continuity and change in rural lives: Historical and developmental insights. *International Journal of Behavioral Development*, *19*(2), 433-456.

Engelmann, J. M., Herrmann, E., & Tomasello, M. (2012). Five-year olds, but not chimpanzees, attempt to manage their reputations. *PLoS One*, *7*(10), e48433.

Engelmann, J. M., Herrmann, E., & Tomasello, M. (2018). Concern for group reputation increases prosociality in young children. *Psychological Science*, *29*(2), 181-190.

Engelmann, J. M., Zhang, Z., Zeidler, H., Dunham, Y., & Herrmann, E. (2021). The influence of friendship and merit on children's resource allocation in three societies. *Journal of Experimental Child Psychology*, *208*, 105149.

Faber, N. S., & Häusser, J. A. (2022). Why stress and hunger both increase and decrease prosocial behaviour. *Current Opinion in Psychology*, *44*, 49-57.

Fabes, R. A., & Eisenberg, N. (1998). Meta-analyses of age and sex differences in children's and adolescents' prosocial behavior. *Handbook of Child Psychology*, *3*, 1-29.

Fehr, E., Bernhard, H., & Rockenbach, B. (2008). Egalitarianism in young children. *Nature*, *454*(7208), 1079-1083.

Fiske, A. P. (1992). The four elementary forms of sociality: framework for a unified theory of social relations. *Psychological Review*, *99*(4), 689-723.

Frankenhuis, W. E., Panchanathan, K., & Nettle, D. (2016). Cognition in harsh and unpredictable environments. *Current Opinion in Psychology*, *7*, 76-80.

Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., ... & Schmeichel, B. J. (2007). Self-control relies on glucose as a limited energy source: willpower is more than a metaphor. *Journal of Personality and Social Psychology*, *92*(2), 325-336.

Graham, J., Nosek, B. A., Haidt, J., Iyer, R., Koleva, S., & Ditto, P. H. (2011). Mapping the moral domain. *Journal of Personality and Social Psychology*, *101*(2), 366-385.

Greenfield, P. M., Keller, H., Fuligni, A., & Maynard, A. (2003). Cultural pathways through universal development. *Annual Review of Psychology*, *54*(1), 461-490.

Gummerum, M., Hanoch, Y., Keller, M., Parsons, K., & Hummel, A. (2010). Preschoolers' allocations in the dictator game: The role of moral emotions. *Journal of Economic Psychology*, *31*(1), 25-34.

Harel, I., & Kogut, T. (2015). Visceral needs and donation decisions: Do people identify with suffering or with relief?. *Journal of Experimental Social Psychology*, *56*, 24-29.

Hastings, P. D., Utendale, W. T., & Sullivan, C. (2007). The socialization of prosocial development. In J.E. Grusec & P.D. Hastings (Eds.), *Handbook of socialization: theory and research*, (pp. 638-664), New York, NY: Guilford Press.

Henrich, J., Boyd, R., Bowles, S., Camerer, C., Fehr, E., Gintis, H., ... & Henrich, N. S. (2005). "Economic man" in cross-cultural perspective: Behavioral experiments in 15 small-scale societies. *Behavioral and Brain Sciences*, *28*(6), 795-815.

Henrich, J., Ensminger, J., McElreath, R., Barr, A., Barrett, C., Bolyanatz, A., ... & Ziker, J. (2010a). Markets, religion, community size, and the evolution of fairness and punishment. *Science, 327*(5972), 1480-1484.

Henrich, J., Heine, S. J., & Norenzayan, A. (2010b). Most people are not WEIRD. *Nature, 466*(7302), 29.

Hofstede, G. (1980). Culture and organizations. *International Studies of Management & Organization*, *10*(4), 15-41.

Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions, and organizations across nations*. Thousand Oaks, CA: Sage Publications.

Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online Readings in Psychology and Culture*, *2*(1), 1-26.

Hofstede, G. & Hofstede, G.J. (1991). *Cultures and organizations: Software of the mind.* London, England: McGraw–Hill.

Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and organizations: Software of the mind* (3rd edition). New York, NY: McGraw-Hill.

Holland, J., Silva, A. S., & Mace, R. (2012). Lost letter measure of variation in altruistic behaviour in 20 neighbourhoods. *PloS one*, *7*(8), e43294.

Hongwanishkul, D., Happaney, K. R., Lee, W. S. C., & Zelazo, P. D. (2005). Assessment of hot and cool executive function in young children: age-related changes and individual differences. *Developmental Neuropsychology, 28*(2), 617-644.

Hook, J. G., & Cook, T. D. (1979). Equity theory and the cognitive ability of children. *Psychological Bulletin*, *86*(3), 429-445.

House, B. R., Silk, J. B., Henrich, J., Barrett, H. C., Scelza, B. A., Boyette, A. H., ... & Laurence, S. (2013). Ontogeny of prosocial behavior across diverse societies. *Proceedings of the National Academy of Sciences*, *110*(36), 14586-14591.

House, B. R., & Tomasello, M. (2018). Modeling social norms increasingly influences costly sharing in middle childhood. *Journal of Experimental Child Psychology, 171*, 84-98.

House, B. R., Kanngiesser, P., Barrett, H. C., Broesch, T., Cebioglu, S., Crittenden, A. N., ... & Silk, J. B. (2020a). Universal norm psychology leads to societal diversity in prosocial behaviour and development. *Nature Human Behaviour*, *4*(1), 36-44.

House, B. R., Kanngiesser, P., Barrett, H. C., Yilmaz, S., Smith, A. M., Sebastian-Enesco, C., ... & Silk, J. B. (2020b). Social norms and cultural diversity in the development of third-party punishment. *Proceedings of the Royal Society B*, *287*(1925), 20192794.

Huppert, E., Cowell, J. M., Cheng, Y., Contreras-Ibáñez, C., Gomez-Sicard, N., Gonzalez-Gadea, M. L., ... & Decety, J. (2019). The development of children's preferences for equality and equity across 13 individualistic and collectivist cultures. *Developmental Science, 22*(2), e12729.

Huppert, E., Shaw, A., & Decety, J. (2020). The effect of hunger on children's sharing behavior and fairness preferences. *Journal of Experimental Child Psychology, 192,* 104786.

Imada, T., Carlson, S. M., & Itakura, S. (2013). East–West cultural differences in context-sensitivity are evident in early childhood. *Developmental Science, 16*(2), 198-208.

Imuta, K., Henry, J. D., Slaughter, V., Selcuk, B., & Ruffman, T. (2016). Theory of mind and prosocial behavior in childhood: A meta-analytic review. *Developmental Psychology, 52*(8), 1192-205.

Jara-Ettinger, J., Gibson, E., Kidd, C., & Piantadosi, S. (2016). Native Amazonian children forego egalitarianism in merit-based tasks when they learn to count. *Developmental Science, 19*(6), 1104-1110.

Jensen, K., Vaish, A., & Schmidt, M. F. (2014). The emergence of human prosociality: aligning with others through feelings, concerns, and norms. *Frontiers in Psychology, 5*, 822.

Jones, M. L. (2007). Hofstede-culturally questionable? Oxford Business & Economics Conference, Oxford, UK.

Kagitcibasi, C. (2005). Autonomy and relatedness in cultural context: Implications for self and family. *Journal of Cross-Cultural Psychology, 36*(4), 403-422.

Kanngiesser, P., & Warneken, F. (2012). Young children consider merit when sharing resources with others. *PloS One, 7*(8), e43979.

Keller, H., Lamm, B., Abels, M., Yovsi, R., Borke, J., Jensen, H., ... & Su, Y. (2006). Cultural models, socialization goals, and parenting ethnotheories: A multicultural analysis. *Journal of Cross-Cultural Psychology, 37*(2), 155-172.

Keller, K. L., Assur, S. A., Torres, M., Lofink, H. E., Thornton, J. C., Faith, M. S., & Kissileff, H. R. (2006). Potential of an analog scaling device for measuring fullness in children: development and preliminary testing. *Appetite, 47*(2), 233-243.

Kienbaum, J., & Wilkening, F. (2009). Children's and adolescents' intuitive judgments about distributive justice: Integrating need, effort, and luck. *European Journal of Developmental Psychology, 6*(4), 481-498.

Killen, M., & Wainryb, C. (2000). Independence and interdependence in diverse cultural contexts. *New Directions for Child and Adolescent Development, 2000*(87), 5-21.

Kim, U., & Choi, S. H. (1994). Individualism, collectivism, and child development: A Korean perspective. In P.M. Greenfield & R.R. Cocking (Eds.), *Cross-cultural roots of minority child development,* (pp. 227-257). Hillsdale, NJ: Lawrence Erlbaum.

Knafo-Noam, A., Vertsberger, D., & Israel, S. (2018). Genetic and environmental contributions to children's prosocial behavior: brief review and new evidence from a reanalysis of experimental twin data. *Current Opinion in Psychology, 20*, 60-65.

Kogut, T. (2012). Knowing what I should, doing what I want: From selfishness to inequity aversion in young children's sharing behavior. *Journal of Economic Psychology*, *33*(1), 226-236.

Kozloff, V., Cowell, J. M., Huppert, E., Gomez-Sicard, N., Lee, K., Mahasneh, R., ... & Decety, J. (2021). An investigation of children's empathic dispositions and behaviours across seven countries. *Infant and Child Development*, *30*(5), e2251.

Lan, X., Legare, C. H., Ponitz, C. C., Li, S., & Morrison, F. J. (2011). Investigating the links between the subcomponents of executive function and academic achievement: A cross-cultural analysis of Chinese and American preschoolers. *Journal of Experimental Child Psychology*, *108*(3), 677-692.

Lancy, D. F. (2010). Learning 'from nobody': The limited role of teaching in folk models of children's development. *Childhood in the Past*, *3*(1), 79-106.

Lancy, D. F., & Grove, M. A. (2011). Getting noticed. *Human Nature*, *22*(3), 281-302.

Legare, C. H. (2017). Cumulative cultural learning: Development and diversity. *Proceedings of the National Academy of Sciences*, *114*(30), 7877-7883.

Legare, C. H. (2019). The development of cumulative cultural learning. *Annual Review of Developmental Psychology*, *1*, 119-147.

LeSauter, J., Hoque, N., Weintraub, M., Pfaff, D. W., & Silver, R. (2009). Stomach ghrelin-secreting cells as food-entrainable circadian clocks. *Proceedings of the National Academy of Sciences*, *106*(32), 13582-13587.

Litvack-Miller, W., McDougall, D., & Romney, D. M. (1997). The structure of empathy during middle childhood and its relationship to prosocial behavior. *Genetic, Social, and General Psychology Monographs*, *123*(3), 303-325.

Malti T., Gummerum M., Keller M., Chaparro M. P., Buchmann M. (2012). Early sympathy and social acceptance predict the development of sharing in children. *PloS One, 7*(12), e52017.

Malti, T., Gummerum, M., Ongley, S., Chaparro, M., Nola, M., & Bae, N. Y. (2016). "Who is worthy of my generosity?" Recipient characteristics and the development of children's sharing. *International Journal of Behavioral Development*, *40*(1), 31-40.

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review*, *98*(2), 224-253.

Martin, A., & Olson, K. R. (2015). Beyond good and evil: What motivations underlie children's prosocial behavior?. *Perspectives on Psychological Science*, *10*(2), 159-175.

McAuliffe, K., Jordan, J. J., & Warneken, F. (2015). Costly third-party punishment in young children. *Cognition*, *134*, 1-10.

McAuliffe, K., Blake, P. R., Steinbeis, N., & Warneken, F. (2017a). The developmental foundations of human fairness. *Nature Human Behaviour*, *1*(2), 0042.

McAuliffe, K., Raihani, N. J., & Dunham, Y. (2017b). Children are sensitive to norms of giving. *Cognition*, *167*, 151-159.

Meidenbauer, K. L., Cowell, J. M., Killen, M., & Decety, J. (2016). A developmental neuroscience study of moral decision-making regarding resource allocation. *Child Development*, doi:10.1111/cdev.12698.

Miller, J. G. (2006). Insight into moral development from cultural psychology. In M. Killen & J. Smetana (Eds.), *Handbook of moral development* (pp. 375-398). Mahwah, NJ: Lawrence Erlbaum.

Miller, J. G., Kahle, S., & Hastings, P. D. (2015). Roots and benefits of costly giving: Children who are more altruistic have greater autonomic flexibility and less family wealth. *Psychological Science*, *26*(7), 1038-1045.

Miyake, A., Friedman, N. P., Emerson, M. J., Witzki, A. H., Howerter, A., & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "frontal lobe" tasks: A latent variable analysis. *Cognitive Psychology*, *41*(1), 49-100.

Mogg, K., Bradley, B. P., Hyare, H., & Lee, S. (1998). Selective attention to food-related stimuli in hunger: are attentional biases specific to emotional and psychopathological states, or are they also found in normal drive states?. *Behaviour Research and Therapy*, *36*(2), 227-237.

Murphy-Berman, V., Berman, J. J., Singh, P., Pachauri, A., & Kumar, P. (1984). Factors affecting allocation to needy and meritorious recipients: A cross-cultural comparison. *Journal of Personality and Social Psychology*, *46*(6), 1267-1272.

Murphy-Berman, V., & Berman, J. J. (2002). Cross-cultural differences in perceptions of distributive justice: A comparison of Hong Kong and Indonesia. *Journal of Cross-Cultural Psychology*, *33*(2), 157-170.

Nettle, D., Colléony, A., & Cockerill, M. (2011). Variation in cooperative behaviour within a single city. *PloS one*, *6*(10), e26922.

Nielsen, M., Haun, D., Kärtner, J., & Legare, C. H. (2017). The persistent sampling bias in developmental psychology: A call to action. *Journal of Experimental Child Psychology, 162*, 31-38.

Olson, K. R., Dweck, C. S., Spelke, E. S., & Banaji, M. R. (2011). Children's responses to group-based inequalities: Perpetuation and rectification. *Social Cognition, 29*(3), 270-287.

Oyserman, D. (2006). High power, low power, and equality: Culture beyond individualism and collectivism. *Journal of Consumer Psychology, 16*(4), 352-356.

Paulus, M. (2014). The early origins of human charity: developmental changes in preschoolers' sharing with poor and wealthy individuals. *Frontiers in Psychology, 5*, 344.

Paulus, M. (2015). Children's inequity aversion depends on culture: a cross-cultural comparison. *Journal of Experimental Child Psychology, 132*, 240-246.

Pepper, G. V., & Nettle, D. (2017). The behavioural constellation of deprivation: Causes and consequences. *Behavioral and Brain Sciences, 40,* E314.

Petersen, M. B., Aarøe, L., Jensen, N. H., & Curry, O. (2014). Social welfare and the psychology of food sharing: Short-term hunger increases support for social welfare. *Political Psychology, 35*(6), 757-773.

Pietraszewski, D., & Shaw, A. (2015). Not by strength alone. *Human Nature, 26*(1), 44-72.

Piff, P. K., Kraus, M. W., Côté, S., Cheng, B. H., & Keltner, D. (2010). Having less, giving more: the influence of social class on prosocial behavior. *Journal of Personality and Social Psychology, 99*(5), 771-784.

Prencipe, A., & Zelazo, P. D. (2005). Development of affective decision making for self and other: Evidence for the integration of first-and third-person perspectives. *Psychological Science, 16*(7), 501-505.

Rabain-Jamin, J., Maynard, A. E., & Greenfield, P. (2003). Implications of sibling caregiving for sibling relations and teaching interactions in two cultures. *Ethos, 31*(2), 204-231.

Radel, R., & Clément-Guillotin, C. (2012). Evidence of motivational influences in early visual perception: Hunger modulates conscious access. *Psychological Science, 23*(3), 232-234.

Range, F., Leitner, K., & Virányi, Z. (2012). The influence of the relationship and motivation on inequity aversion in dogs. *Social Justice Research, 25*(2), 170-194.

Rao, N., & Stewart, S. M. (1999). Cultural influences on sharer and recipient behavior: Sharing in Chinese and Indian preschool children. *Journal of Cross-Cultural Psychology, 30*(2), 219-241.

Raver, C. C., Blair, C., & Willoughby, M. (2013). Poverty as a predictor of 4-year-olds' executive function: new perspectives on models of differential susceptibility. *Developmental Psychology*, *49*(2), 292-304.

Rehberg, H. R., & Richman, C. L. (1989). Prosocial behaviour in preschool children: A look at the interaction of race, gender, and family composition. *International Journal of Behavioral Development, 12*(3), 385-401.

Rizzo, M. T., Elenbaas, L., Cooley, S., & Killen, M. (2016). Children's recognition of fairness and others' welfare in a resource allocation task: Age related changes. *Developmental Psychology*, *52*(8), 1307-1317.

Rizzo, M. T., & Killen, M. (2016). Children's understanding of equity in the context of inequality. *British Journal of Developmental Psychology*, *34*(4), 569-581.

Robbins, E., & Rochat, P. (2011). Emerging signs of strong reciprocity in human ontogeny. *Frontiers in Psychology*, *2*, 353.

Rochat, P., Dias, M. D., Liping, G., Broesch, T., Passos-Ferreira, C., Winning, A., & Berg, B. (2009). Fairness in distributive justice by 3-and 5-year-olds across seven cultures. *Journal of Cross-Cultural Psychology*, *40*(3), 416-442.

Roux, C., Goldsmith, K., & Bonezzi, A. (2015). On the psychology of scarcity: When reminders of resource scarcity promote selfish (and generous) behavior. *Journal of Consumer Research*, *42*(4), 615-631.

Sabbagh, M. A., Xu, F., Carlson, S. M., Moses, L. J., & Lee, K. (2006). The development of executive functioning and theory of mind: A comparison of Chinese and US preschoolers. *Psychological Science, 17*(1), 74-81.

Safra, L., Tecu, T., Lambert, S., Sheskin, M., Baumard, N., & Chevallier, C. (2016). Neighborhood deprivation negatively impacts children's prosocial behavior. *Frontiers in Psychology*, *7*, 1760.

Santamaría-García, H., González-Gadea, M. L., Di Tella, R., Ibáñez, A., & Sigman, M. (2018). The interplay between sharing behavior and beliefs about others in children during dictator games. *Journal of Experimental Child Psychology*, *166*, 451-464.

Schäfer, M., Haun, D. B., & Tomasello, M. (2015). Fair is not fair everywhere. *Psychological Science, 26*(8), 1252-1260.

Schmidt, M. F., & Sommerville, J. A. (2011). Fairness expectations and altruistic sharing in 15-month-old human infants. *PloS One*, *6*(10), e23223.

Schmidt, M. F., Svetlova, M., Johe, J., & Tomasello, M. (2016). Children's developing understanding of legitimate reasons for allocating resources unequally. *Cognitive Development, 37*, 42-52.

Seymour, S. C. (1999). *Women, family, and child care in India: A world in transition*. Cambridge, England: Cambridge University Press.

Shah, A. K., Shafir, E., & Mullainathan, S. (2015). Scarcity frames value. *Psychological Science*, *26*(4), 402-412.

Sharma, E., & Alter, A. L. (2012). Financial deprivation prompts consumers to seek scarce goods. *Journal of Consumer Research*, *39*(3), 545-560.

Shaw, A., DeScioli, P., & Olson, K. R. (2012). Fairness versus favoritism in children. *Evolution and Human Behavior*, *33*(6), 736-745.

Shaw, A., & Olson, K. R. (2012). Children discard a resource to avoid inequity. *Journal of Experimental Psychology: General*, *141*(2), 382-395.

Shaw, A., Montinari, N., Piovesan, M., Olson, K. R., Gino, F., & Norton, M. I. (2014). Children develop a veil of fairness. *Journal of Experimental Psychology: General*, *143*(1), 363-375.

Sheskin, M., Nadal, A., Croom, A., Mayer, T., Nissel, J., & Bloom, P. (2016). Some equalities are more equal than others: Quality equality emerges later than numerical equality. *Child Development*, *87*(5), 1520-1528.

Shutts, K., Brey, E. L., Dornbusch, L. A., Slywotzky, N., & Olson, K. R. (2016). Children use wealth cues to evaluate others. *PloS One*, *11*(3), e0149360.

Sigelman, C. K., & Waitzman, K. A. (1991). The development of distributive justice orientations: Contextual influences on children's resource allocations. *Child Development*, *62*(6), 1367-1378.

Sloane, S., Baillargeon, R., & Premack, D. (2012). Do infants have a sense of fairness? *Psychological Science*, *23*(2), 196-204.

Smith, C. E., Blake, P. R., & Harris, P. L. (2013). I should but I won't: Why young children endorse norms of fair sharing but do not follow them. *PloS One*, *8*(3), e59510.

Smith, K. M., Larroucau, T., Mabulla, I. A., & Apicella, C. L. (2018). Hunter-gatherers maintain assortativity in cooperation despite high levels of residential change and mixing. *Current Biology*, *28*(19), 3152-3157.

Spinrad, T. L., & Gal, D. E. (2018). Fostering prosocial behavior and empathy in young children. *Current Opinion in Psychology*, *20*, 40-44.

Starmans, C., Sheskin, M., & Bloom, P. (2017). Why people prefer unequal societies. *Nature Human Behaviour*, *1*(4), 1-7.

Steinbeis, N. (2018). Taxing behavioral control diminishes sharing and costly punishment in childhood. *Developmental Science, 21*(1), e12492.

Steinbeis, N., & Crone, E. A. (2016). The link between cognitive control and decision-making across child and adolescent development. *Current Opinion in Behavioral Sciences*, *10*, 28-32.

Steinbeis, N., & Over, H. (2017). Enhancing behavioral control increases sharing in children. *Journal of Experimental Child Psychology*, *159*, 310-318.

Strommen, E. A. (1973). Verbal self-regulation in a children's game: impulsive errors on" Simon Says." *Child Development, 44*(4), 849-853.

Triandis, H. C. (2001). Individualism-collectivism and personality. *Journal of Personality*, *69*(6), 907-924.

Tucker, C. J., Updegraff, K. A., McHale, S. M., & Crouter, A. C. (1999). Older siblings as socializers of younger siblings' empathy. *The Journal of Early Adolescence*, *19*(2), 176-198.

Vredenburgh, C., Yu, Y., & Kushnir, T. (2017). Young children's flexible social cognition and sensitivity to context facilitates their learning. In J. A. Sommerville & J. Decety (Eds.), *Social cognition: Development across the life span*. New York, NY: Routledge.

Winkleby, M.A., Jatulis, D.E., Frank, E., & Fortmann, S.P. (1992). Socioeconomic status and health: how education, income, and occupation contribute to risk factors for cardiovascular disease. *American Journal of Public Health, 82*(6), 816–820.

Xu, A. J., Schwarz, N., & Wyer, R. S. (2015). Hunger promotes acquisition of nonfood objects. *Proceedings of the National Academy of Sciences*, *112*(9), 2688-2692.

Yağmurlu, B., Sanson, A., & Köymen, S. B. (2005). Effects of parenting and child temperament on the development of prosocial behavior: The mediating role of theory of mind. *Turkish Journal of Psychology*, *20*, 1-20.

Zahavi, D., & Rochat, P. (2015). Empathy ≠ sharing: Perspectives from phenomenology and developmental psychology. *Consciousness and Cognition*, *36*, 543-553.

Zelazo, P. D. & Carlson, S. M. (2012). Hot and cool executive function in childhood and adolescence: Development and plasticity. *Child Development Perspectives*, *6*(4), 354-360.

Zhang, Z. (2020). The impact of social relationships on children's distributive justice. *Developmental Psychology*, *56*(1), 103-116.