Early Understanding and Use of Social Status Information

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Abstract

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Social status, or hierarchies in which some people are positioned higher or lower than others based on a desirable dimension are ubiquitous. Social status also has important consequences for how people are treated such that higher status people receive perks and other benefits over lower status people. Adults readily recognize differences in status and potential consequences of status; however, less is known about the development of status understanding and whether children hold preferences based on others' social status and act on these preferences. This dissertation aims to address these gaps by investigating early status understanding, preferences based on others' social status, and prosociality based on a recipient's social status. In Chapter 2, I investigated social status expectations in 17-month-old infants. Across five experiments, I found that infants recognize physical dominance differences and expect physically dominant individuals to receive

more resources than less physically dominant individuals. Building off this work, in Chapter 3, I investigated whether social status impacts toddlers' *own* behavior. I found that toddlers were more likely to help resource-rich over resource poor individuals suggesting that status information impacts behavior within the first two years of life. To determine whether there are developmental changes in early understanding and use of social status information, in Chapter 4, I investigated 4-6-year-old children's social status understanding, preferences, and behavior based on status. I found that 4-6-year-old children recognized social status differences and preferred high-status over low-status people. However, there was a developmental shift in children's prosocial behavior based on status. Both 5- and 6-year-old children gave more to low-status people thus correcting inequities, whereas 4-year-old children gave equally to high- and low-status people. Taken together, these studies suggest that even toddlers and young children pay attention to status and use this information to inform their preferences and prosocial behavior.

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DEDICATION

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Chapter 1. INTRODUCTION

Social status hierarchies are ubiquitous: social status differences are found across the world (Brown, 1991), history (van Vugt & Tybur, 2014), and throughout development (Hawley, 1999). For example, in the United States, there are vast differences in income (Saez, 2018): some families have an excess of wealth such that children have access to adequate nutrition, the best healthcare, private schools, and the newest toys and clothes whereas less well-off families use hand-me-downs and barely make ends meet. Additionally, there are many other status differences; notably, people differ in decision making power, prestige, and physical dominance. In fact, researchers have found that even children have their own social status hierarchies (Hawley, 2002). Since these status hierarchies are pervasive, it is important to know if toddlers and children recognize social status differences, hold preferences based on status, and act on status differences. Additionally, by studying infants and young children, researchers can elucidate the origins of later social status understanding and biases. In this dissertation I investigated these questions by determining 1) whether from a young age toddlers and children recognize social status differences, 2) whether social status impacts preferences, and 3) whether social status impacts prosocial behavior.

1.1 WHAT IS SOCIAL STATUS?

For the purpose of this dissertation, I define social status broadly as any hierarchy in which some people are positioned or ranked higher or lower than others based on a desirable social dimension (e.g. Magee & Galinsky, 2008). This definition is broad to encompass a wide range of valued dimensions. One dimension of status that has been studied is wealth or power which researchers have defined as possessing or having access to a greater number of resources

(Smith & Galinsky, 2010; Van Vugt & Tybur, 2015). Other researchers have operationalized social status in terms of physical dominance or other means of overpowering others to achieve goals (Mascaro & Csibra, 2012). Yet other researchers have studied multiple dimensions of social status including prestige, dominance, norm setting, and decision-making power (Cheng, Tracy, & Henrich, 2010; Gulgoz & Gelman, 2017; Henrich & Gil-White, 2001). In this dissertation I take a similar broad approach by studying multiple dimensions of social status in order to gain a more comprehensive understanding of social status.

1.2 Dimensions of status

One dimension of social status that has been studied extensively in non-human animals is physical dominance where bigger and stronger individuals get selective access to resources and mates over smaller and weaker individuals (Dewsbury, 2019). These physical dominance hierarchies have been found in many diverse species including non-human primates (Monsalve, Wickings, & Knapp, 2006), fish (Buston, 2003), and meerkats (Clutton-Brock et al., 2006). Not only does physical dominance dictate status in non-human animals, but physical dominance is also valued by humans. Professional athletes like Lebron James and Aaron Rodgers are valued for their incredible athletic abilities because of their size, speed, and strength, and we can see this on a smaller scale where the big kid on the playground can impose their will over smaller children.

However, unlike other non-human species, researchers have found that humans also value and use more abstract dimensions of social status. For example, we would not describe Gandhi as being particularly physically dominant, but Gandhi still has high social status because of his prestige and leadership. In fact, scholars have proposed that prestige is a separate dimension of social status from physical dominance (Cheng, Tracy, Foulsham, Kingstone, &

Henrich, 2013; Henrich & Gil-White, 2001). In prestige based social status, people gain status through admiration of knowledge held (Henrich & Gil-White, 2001). We can see examples of prestige in everyday life where professors are admired for their intellect and younger children look up to older children for their superior skills. Beyond prestige and physical dominance, we also see differences in decision-making power (where bosses make decisions over employees and parents make decisions over their children) and differences in wealth (where some people have lots of resources whereas other people have little). This list of social status dimensions is not comprehensive but highlights four of the most well researched areas of social status and the dimensions studied in this dissertation.

Although each dimension of status is unique and individuals may rank high in one dimension and low in another, often people who rank high in one dimension of status also rank high in other dimensions of status. For example, a CEO of a major company is likely high in decision making power, wealth, and prestige. When someone is high in multiple dimensions of status it is often hard to determine whether one dimension caused an individual to be high on another dimension or vice versa. For example, a CEO may have a lot of wealth as a consequence of holding a powerful position or the powerful position could be a result of possession of high levels of wealth. Alternatively, an individual who is both wealthy and has a history of making successful business decisions is likely to earn a CEO position for rating highly in multiple social status domains. In this dissertation I focus on infants' and children's understanding, preferences, and prosocial behavior based on one dimensions of social status at a time in order to determine whether children recognize and use multiple dimensions of status when forming preferences and engaging in prosocial behavior.

1.3 Why is it important to study early social status understanding, preferences based on status, and prosociality based on status?

One reason why it is important to study early social status understanding, preferences, and prosociality is because social status differences already occur from a young age (Hawley, 1999) and could potentially impact children's social relationships. If children systematically prefer and help high-status individuals like adults do (Bickman, 1971; Goodman & Gareis, 1993; Kirby, 2006; Lott, 2012; Lott & Saxon, 2002), children may then systematically treat their high-status peers differently than low-status peers. Social relationships are crucial for self-worth (Parker, Rubin, Erath, Wojsklawowicz, & Buskirk, 2006), academic achievement (Hattie, 2008), and health (House, Landis, & Umberson, 1988) and therefore these status-based preferences and behaviors could negatively harm low-status children. Thus, researchers should determine how young children view others' social status and how young children *act* on this social status information since it can have important real-world consequences for young children.

Second, studying development can help us gain insights about later biases in adulthood as adult biases could stem from childhood biases. Additionally, infants, toddlers, and even children experience less socialization than adults, so by studying the developmental origins of status perceptions we can learn how humans use and act on social status differences before much of socialization has taken root.

Studying how toddlers and children use status information can also help researchers gain a better understanding of early social cognition. Past work has found that infants form expectations about others' actions and evaluate others from early on; by their first birthday, infants prefer prosocial over antisocial others (For a review see: Margoni & Surian, 2018). Additionally, by their second birthday, infants expect people to act fairly (Geraci & Surian,

1984; Schmidt & Sommerville, 2011; Sloane, Baillargeon, & Premack, 2012), prefer fair over unfair people (For a review see: Margoni & Surian, 2018), and will help fair over unfair people (Surian & Franchin, 2017). If I find that infants and toddlers also hold expectations about social status and selectively help based on status differences, this work would add to the growing body of literature suggesting that infants have a sophisticated understanding of social relationships and evaluate others' social actions. However, if infants and toddlers do not yet recognize social status, this would suggest that infants and toddlers' social evaluations and understanding may be limited to specific social domains like morality.

This work is also important because it can help inform debates in the field regarding the developmental origins of prosociality and the initial motivations for engaging in prosocial behavior. For example, it is possible that prosocial behavior is primarily motivated out of a concern for others' needs. Alternatively, it is possible that prosocial behavior is primarily motivated based on wanting to affiliate or interact with certain people. If toddlers and children are primarily motivated by a concern for others' needs, we would expect them to selectively help low-status individuals. On the other hand, if toddlers and children are motivated by other factors like wanting to interact or affiliate with people, they could receive perks from, we would expect toddlers and children to selectively help high-status individuals. By testing both toddlers and children I can also determine whether there are developmental changes in the motivations for prosocial behavior.

1.4 Overview of the chapters in this dissertation

This dissertation investigates the developmental origins of social status understanding and how social status may impact early preferences and prosociality. Specifically, I focus on four dimensions of social status: physical dominance (possessing the physical strength or size to

achieve goals over others), wealth (having more resources than others), decision-making power (being able to order others to do one's bidding, and make decisions that will be followed by others), and prestige (being followed/admired because of desired skills or expertise).

In Chapter 2, I build on past research to test whether 17-month-old infants expect physically dominant individuals to receive more resources than less physically dominant individuals. I chose to further investigate infants' understanding of physical dominance since researchers have recently found that infants remember physical dominance information (Pun, Birch, & Baron, 2016; Mascaro & Csibra; 2012; 2014; Thomsen, Frankenhuis, Ingold-Smith, & Carey, 2011). Since Chapter 2 and past work suggests that infants do have an early understanding of status, in Chapter 3, I test whether 17-month-olds will *act* on social status information and selectively help high- or low-status individuals. This is an important question to answer in order to understand whether social status biases emerge from a young age. In Chapter 3, I manipulated social status based on differences in wealth since past work has found that infants recognize differences in resource distributions (Geraci & Surian, 1984; Schmidt & Sommerville, 2011; Sloane et al., 2012) so it is likely that toddlers will also pick up on this social status dimension. Finally, in Chapter 4, I investigate whether there is developmental change in social status understanding and prosociality based on status by testing 4-, 5-, and 6-year-old children. Not only do I investigate whether children recognize social status, have preferences based on status, and give based on status, but I also examine these questions using all four aforementioned social status dimensions. It is likely that children may also pick up on more subtle dimensions of status where physical cues are not present (e.g. prestige and decision-making power).

Taken together, this work helps to investigate both the developmental origins of social status understanding and how perceptions and prosociality based on social status changes with age. This dissertation also takes a multimethod approach using looking time studies, behavioral choice measures, and question asking methods to better understand how toddlers and children use social status information. These chapters add to the developmental literature by gaining a more comprehensive view of early social status understanding, testing how social status influences early preferences to determine whether status biases are present from a young age, and adds to work on prosocial behavior to determine whether social status impacts prosociality and changes with age.

Chapter 2. ‘TO THE VICTOR GO THE SPOILS’: INFANTS EXPECT RESOURCES TO ALIGN WITH DOMINANCE STRUCTURES

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2.1 ABSTRACT

Previous research has found that within the first year of life infants possess rich knowledge about social structures (i.e., that some individuals are dominant over other individuals) as well as expectations about resource distributions (i.e., that resources are typically distributed equally to recipients). We investigated whether infants' expectations about resource distribution can be modulated by information about the dominance structure between the recipients. We first replicated the finding that infants attribute a stable dominance hierarchy to a pair of individuals when their goals conflicted and one individual yielded to the other (Expt. 1), and that this sensitivity is not driven by lower-level perceptual factors (Expt. 2). In Experiments 3 – 5, we tested our main hypothesis that infants' attention to equal and unequal distributions varies as a function of prior social dominance information. We first replicated and extended prior work by establishing that infants looked significantly longer to unequal than equal resource distributions when no prior information about dominance was provided about recipients (Expt. 3). Critically, following social dominance information, infants looked significantly longer to an equal distribution of resources than a distribution that favored the dominant individual (Expt. 4), and looked significantly longer when the submissive individual received more resources compared to when the dominant individual received more resources (Expts. 4 & 5). Together, these findings suggest that infants expect resources to align with social dominance structures.

2.2 Chapter 2 Introduction

Social dominance, or the tendency of a given individual to prevail over another individual in a conflict, is a defining feature of social relationships and social structures across a range of societies (Cummins, 2000; Fiske, 2010). Social dominance has consequences for an individual's, or a group's, well-being and success: socially dominant individuals are more likely to obtain advantageous outcomes and resources such as food, territory, and mates than submissive individuals (Berger, Rosenholtz, Zelditch, 1980; Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013; Ellis, 1995; Mascaro & Csibra, 2012). In fact, social dominance affects not only the personal acquisition of resources, but the perception of social dominance often leads to a reinforcement of the status quo by others (Van Berkel, Crandall, Eidelman, & Blanchar, 2015). Therefore, the ability to detect social dominance, and the ability to recognize the consequences of social dominance, are central to navigating the social world.

Existing research suggests that the detection or recognition of dominance is ubiquitous, easily accessible, and fundamental to adults' social cognition. Indeed, social dominance is so readily perceived that adults can identify who is in charge based solely on non-verbal cues, such as body posture (body expansion vs. body diminishment), and eye gaze (direct vs. averted eye gaze) (Ellyson & Dovidio, 1985; Mast & Hall, 2004; Rule, Adams, Ambady, & Freeman, 2012; Shariff, Tracy, & Markusoff, 2012). Adults also believe that where one stands in a social hierarchy is associated with particular benefits and outcomes. For example, researchers have argued that adults generally expect that higher status individuals are deserving of more resources than lower-status individuals (Rai & Fiske, 2011). Thus, adults recognize cues that define social hierarchies, link one's position in a social hierarchy to the possession of resources, and sometimes act to reinforce social hierarchies.

2.2.1 *The development of representing social dominance*

Although much is known about how adults represent social dominance, the majority of research in developmental psychology has focused on dominance within the context of children's own social interactions and where they belong in social hierarchies (Boulton & Smith, 1990; Edelman & Omark, 1973; Russon & Waite, 1991; Sluckin & Smith, 1977; Strayer & Strayer, 1976). However, some existing research has investigated children's ability to detect differences in social status in groups of individuals as third-party observers. This work has demonstrated that children readily recognize social groups that differ in their status (e.g., groups with higher vs. lower academic achievement or drawing ability) and develop preferences for higher-status groups over lower-status groups (Bigler, Brown, & Markell, 2001; Nesdale & Flesser, 2001). Moreover, children can detect differences in social status based on subtle cues such as posters in the classroom depicting one group as being more successful by having more of those group members win a spelling bee. Children recognize the difference between the higher- and lower-status groups and only demonstrate attitudes favoring their in-group when they are members of high-status groups (Bigler et al., 2001). Subsequent studies have determined that preferences for higher-status social group members may be due to the fact that children associate high-status group members with the possession of material benefits: for example, children predict that White South Africans are wealthier than Black and multiracial South Africans (Olson, Shutts, Kinzler, & Weisman, 2012). Therefore, children recognize different groups based on their status, prefer high-status individuals, and assume that differences in status are associated with positive real-world consequences, such as material benefits.

More work has also assessed children's ability to detect and represent social dominance at the level of individual agents. Recent studies (Brey & Shutts, 2015; Charafeddine, Mercier,

Clement, Kaufmann, Berchtold, Reboul, and Van der Henst, 2015) have demonstrated that 3- to 5-year-old children can reliably identify who is in charge, or who is the boss, based on cues such as body posture, eye gaze, head tilt, age, physical supremacy, and the ability to 'impose one's decisions' on others. Children think that older individuals, individuals who win a play fight, and individuals who get to choose what game to play, are dominant. Children are also able to use resource cues to determine who is dominant: specifically, they were significantly more likely to say that an individual with more resources is the boss. Therefore, children were explicitly able to use a number of different cues to represent social dominance.

Several studies suggest that even infants show sensitivity to social dominance. In one study, researchers found that 10- and 13-month-old infants expected a smaller geometric shape to bow down and allow a larger geometric shape to pass in a confined physical space, suggesting that they can use size as a cue to dominance (Thomsen, Frankenhuis, Ingold-Smith, & Carey, 2011). Furthermore, infants as young as 6 months of age can use numerical group size to infer dominance (Pun, Birch, Baron, 2016). Other studies have demonstrated that 15-month-old infants can identify dominance relations based solely on behavioral cues (i.e., prevailing at achieving a goal) in the absence of perceptual cues such as size: when infants saw one individual chase another individual out of an enclosed space, they subsequently expected the previously dominant individual to prevail in obtaining more resources in a resource competition than the submissive individual (Mascaro & Csibra, 2012). Infants also go beyond representing the relative dominance between two individuals: after learning that agent A prevails over agent B, and B prevails over C, infants expect A to prevail over C (rather than vice versa), suggesting that infants make transitive inferences about dominance within the same context (Gazes, Hampton, & Lourenco, 2015; Mascaro & Csibra, 2014). Taken together, these findings suggest that early on

in development, infants are sensitive to cues to dominance and recognize dominance as a stable characteristic of relationships between individuals (but see General Discussion for a potential alternative casting of these findings).

2.2.2 *The development of expectations about resource distributions*

A critical question addressed by the current set of experiments is whether infants take into account dominance information when reasoning about resource distributions. Both adults and children have expectations concerning how resources are, or should be, distributed. Specifically, researchers have found that adults and children have strong preferences for equal distributions of resources in the absence of background information about the recipients (Deutsch, 1975; Haidt, 2007; Fehr & Schmidt, 1999; Rochat, Dias, Liping, Broesch, Passos-Ferreira, Winning, & Berg, 2009). Children as young as 3 years of age will share or give out resources equally across individuals (Baumard, Mascaro & Chevallier, 2012; Damon, 1979; Hook & Cook, 1979; Olson & Spelke, 2008) and will act to reinstate equality when equality has been violated (Shaw & Olson, 2013). In fact, by 6 to 8 years of age, children's inequity aversion is so strong that they would even discard a resource rather than distribute unequally across recipients who had equal merit (Shaw & Olson, 2012), and 8-year-olds will reject unequal offers even when the inequity advantages themselves (Blake & McAuliffe, 2011).

Recent work has suggested that even infants have expectations about how resources will be allocated. For instance, evidence suggests that 15-month-old infants will look longer at unequal compared to equal distributions when no prior information is given about the recipients (Geraci & Surian, 2011; Schmidt & Sommerville, 2011; Sloane, Baillargeon, & Premack, 2012). Infants also prefer individuals who distribute resources equally over those that do so unequally (Burns & Sommerville, 2014; Geraci & Surian, 2011). Therefore, infants seem to have an

expectation for equal distributions of resources when no information about the recipients is given, implying a norm of equality, and favor those that follow this norm.

There is also evidence, however, that in appropriate situations, children adjust expectations about how resources are, and should be, distributed when background information about recipients is available. Five-year-old children will give more resources to individuals who are poor (i.e., have few resources to begin with) than individuals who are wealthy (i.e., have more resources to begin with; Paulus, 2014), and take wealth into account when deciding how to share resources (Paulus, Gillis, Li, & Moore, 2013). Children also consider merit when deciding how to distribute resources: children will share more resources such as stickers with a recipient who does more work than the recipient who does less work (Baumard, Mascaro, & Chevallier, 2012; Kanngiesser & Warneken, 2012; Nelson & Dweck, 1977; Sigelman & Waitzman, 1991). Other factors such as a child's relationship with the recipient influence how children choose to share with recipients. For instance, children believe others should share more with a friend than a stranger and will themselves share more with friends (Moore, 2009; Olson & Spelke, 2008). Similarly, children share more resources when a child who is a part of their own in-group is watching the resource distribution than a child who is a member of the out-group is watching the resource distribution (Engelmann, Over, Herrmann, & Tomasello, 2013). Finally, a recent study finds cultural variability in the extent to which children and adults consider relative merit in their resource distributions (Schäfer, Haun, & Tomasello, 2015).

New research has just begun to investigate whether infants take into account additional information when forming expectations regarding how resources are distributed. One study found that infants may use merit to form expectations about how resources will be distributed (Sloane, Baillargeon, & Premack, 2012). Infants saw a video where either two individuals

worked (i.e., cleaned up toys) or a video in which one individual worked whereas the other individual did not. Following these videos, a third distributor came in and gave both individuals a sticker. Twenty-one-month-old infants looked significantly longer at the sticker distribution when one individual worked and the other did not than when both individuals worked. This indicates that infants expected resources to be distributed on the basis of effort or work. Similarly, infants sometimes prefer individuals that violate the equality norm versus abide by the equality norm. Fifteen-month-old infants' preferences for individuals that produce equal versus unequal distributions depends on whether or not the inequality has positive benefits for same-race members (Burns & Sommerville, 2014). Under conditions in which other-race members benefit from inequality infants prefer individuals that distribute resources equally; under conditions in which distributors give more to same-race members infants prefer individuals that distribute resources unequally. Together, these findings show that infants can take into account background information about recipients when forming expectations regarding how resources will be distributed.

2.2.3 *Coordinating Social Dominance and Resource Distributions*

Research indicates that adults' knowledge of social dominance has consequences for expectations regarding resource possession and distribution. Although adults and children value equality in resource distributions (Fehr & Schmidt, 1999; Rai & Fiske, 2011; Rand, Tarnita, Ohtsuki, & Nowak, 2013), adults also recognize that dominant, higher-ranking individuals often receive more resources (Jost, Banaji, & Nosek, 2004; Rai & Fiske, 2011). In fact, one study found that when adults were under time pressure, they were significantly more likely to give more resources (such as time and money) to high-status individuals over lower-status individuals

(Van Berekl et al., 2015). Thus, adults consider dominance when distributing resources, and expect dominant individuals to receive more than submissive individuals.

Charafeddine and colleagues (2015) found that 3- to 5-year-old children, like adults, link dominance to obtaining more resources. In their study, after identifying one individual as dominant based on their posture, children inferred that the dominant individual had more resources. Therefore, there is some evidence showing that children expect individuals with more resources to be dominant, and that dominant individuals are more likely to have more resources. It remains unclear whether infants hold expectations that dominant individuals will have more than submissive individuals.

The goal of the present work is to ask whether infants integrate information about social dominance with their expectations about resource distribution outcomes. More generally, the ability to link social dominance and resource distribution can be broadly construed as a case where information about properties of agents, or relationships between agents, can modulate expectations about event outcomes. Past work suggests that infants can use internal, dispositional properties of agents to shape their expectations regarding how events will play out. For instance, infants use information about agents' moral dispositions (e.g., helping or hindering a third agent) to predict whom the third agent would approach (Kuhlmeier, Wynn, & Bloom, 2003). They also use agents' relative competence (e.g., relative frequency or distribution of successful vs. unsuccessful causal actions across agents) to evaluate their actions (Jara-Ettinger, Tenenbaum, & Schulz, 2015) or infer causes of their own failures (Gweon & Schulz, 2011). In these studies, infants had to infer these properties from the agents' actions with the physical or the social world and integrate this information to form an expectation about another event. In the current study, infants faced a similar challenge; they had to infer two agents' relative dominance from their

actions and use this information to modulate their predictions about how resources would be distributed to the two agents.

2.2.4 *The Current Set of Experiments*

The goal of the present work is to ask whether infants integrate information about social dominance with their expectations about resource distribution outcomes. Prior work has found sensitivity to social dominance within the first year of life (Gazes et al., 2015; Pun et al., 2016; Thomsen et al., 2011) and expectations about resource distribution in the second year of life (Geraci & Surian, 2011; Schmidt & Sommerville, 2011). Since our main question was whether infants integrate these two concepts, we tested 17-month old infants, an age range we expected to see evidence for both.

While our stimuli used conceptually similar scenarios (conflict of goals and submission of one agent to another), several superficial features of the stimuli were different from past research. Therefore, before we tested our main question of interest, we wanted to ensure that infants detected dominance in the videos we used for stimuli. We tested this in Experiment 1 and Experiment 2. In Experiment 1 we replicated prior work on infants' ability to represent dominance by investigating infants' sensitivity to changes to the dominance structure. In Experiment 2 we ruled out the possibility that low-level perceptual factors could explain infants' successful detection of changes to social dominance in Experiment 1. These studies both replicate and extend prior work by adding convergent evidence that infants' sensitivity to dominance relations is robust across various contexts. In Experiments 3 – 5, we used these stimuli to test our main hypothesis that infants' attention to equal and unequal distributions varies systematically depending on the social dominance structure. In Experiment 3 we tested whether infants expect equal distributions in the absence of prior information about recipients

using a novel distribution task, given prior work demonstrating equality expectations under similar conditions. In Experiments 4 and 5, infants first saw videos conveying dominance information and then received the resource distribution task. This allowed us to ask whether infants suspend their expectations about equal distribution of resources given information about the relative dominance structure (i.e., that the dominant individual will receive more resources than the submissive individual).

2.3 EXPERIMENT 1

Experiment 1 aims to replicate and extend past findings demonstrating that infants can detect reversals of social dominance (Mascaro et al., 2012, 2014), using a novel dominance situation. Before going on to test our main question of interest in Experiments 3-5, we wanted to determine whether, 17-month-old infants could detect and remember the dominance structure portrayed in our videos.

2.3.1 *Method*

2.3.1.1 Participants

Sixteen 17-month-old infants participated in Experiment 1 (*M* = 17 months, 17 days, range = 16 months, 27 days to 18 months, 11 days; 9 girls). In all of the experiments, we had a set of pre-determined exclusion criteria such that infants who were fussy and did not make it to the test videos, infants who did not meet the habituation criteria (described below), infants who looked 2.5 SD above or below the mean at test, or infants for whom there was a procedural error, were excluded from the final sample. This exclusion criteria was used for all five of the experiments. In Experiment 1, eleven additional infants were tested but were excluded from the experiment due to fussiness (*n* = 7), failure to habituate (*n* = 2), a procedural error of the

computer not starting to play the videos, (n = 1), and looking 2.5 SD below the mean at test (n = 1). All infants in all of the experiments who participated were full-term and typically developing. Participants in all of the experiments were recruited from a database of parents who said they were interested in having their child participate in research. All parents of the participants in Experiment 1 completed their bachelor's degree or higher. Of the participants, 11 were White, 2 were Asian, and 3 were Multiracial, as identified by their parents. All participants were treated according to the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 2002).

2.3.1.1 Procedure

In all of the experiments, infants were seated on their parents' laps for the duration of the experiment. Parents were instructed to gaze neutrally at the top of their infants' heads in order to ensure that they would not influence their infants' looking or behavior. The primary experimenter ensured that parents complied with these instructions.

Additionally, in all of the experiments, infants participated in a habituation phase where looking to the video outcomes was measured. Once infants habituated, they viewed two test videos where again looking time was measured to the outcomes of the videos. Habituation and test videos for each of the experiments can be found at: https://osf.io/je4hk/wiki/home/.

2.3.1.1 Habituation phase

Infants watched videos in which one puppet played a dominant role and a second puppet played a submissive role. These videos were loosely modeled off videos used in previous research (Mascaro et al., 2012; Thomsen et al., 2011).

During habituation, infants saw a video featuring two objects and two puppets. One object was a purple chair and the other object was a brown stool (see Figure 2.1a). The seat of the purple chair was higher than the brown stool. Both of the puppets were human-like. One of the puppets had short brown hair and was wearing a blue shirt with blue jeans and red shoes. The other puppet had short blonde hair and was wearing a primarily red shirt with one blue stripe in the middle with blue jeans and red shoes (see Figure 2.1b). The chairs appeared first in the videos (for 1 second) and then the two puppets entered from opposite sides of the screen. Both puppets simultaneously approached and tried to take a seat in the more attractive purple chair (Figure 2.1b). After bumping into the chair three times trying to compete for the attractive chair, the puppet playing the submissive role backed away from the purple chair and bowed down. The puppet playing the dominant role then sat on the purple chair. After the dominant puppet was seated in the purple chair, the submissive puppet got up and sat on the brown stool. The video then cut to a static outcome depicting each puppet sitting on his respective chair/stool (See Figure 2.1c). The dominance video was about 16 seconds long.

2.3.1.1 Test Phase

Following habituation, infants viewed two test trials. These test videos were structurally the same as the videos viewed during habituation where one puppet was dominant and ‘achieved the goal’ of sitting on a more attractive chair and the other puppet was submissive and ended up sitting on the brown stool. Although the videos were structurally the same, there were some changes. In both test videos, the location of the chair and stool were reversed in comparison to habituation trials (see Figure 2.1d). Additionally, in one video the dominance structure was reversed and in one video the dominance structure was preserved. In the Dominance Preserved test trial, the puppets switched sides (compared to habituation) such that the dominance structure

was preserved (e.g., Puppet A was still the dominant puppet and Puppet B was still the submissive puppet) (see Figure 2.1e, 2.1f). In the Dominance Reversed test trial, the sides of the puppets were preserved resulting in a reversal of the dominance structure (e.g., Puppet A was now submissive and Puppet B was now dominant) (see Figure 2.1e, 2.1f). Thus, both test events were different from the habituation event but only the Dominance Reversed test event involved a change in the dominance structure. Infants' looking was timed to the static outcome of the test events until they looked away for one second. If infants detected the change in the dominance structure of the event, we predicted that infants would look longer to the Dominance Reversed test trial compared to the Dominance Preserved test trial. Test videos were also 16 seconds long.

The side the puppets first entered on (left versus right), the sides the objects first appeared on (left versus right), the identity of the dominant puppet during habituation trials (blond-haired versus brown-haired puppet), and the test trial order (Dominance Preserved versus Dominance Reversed test trial first) were counterbalanced.

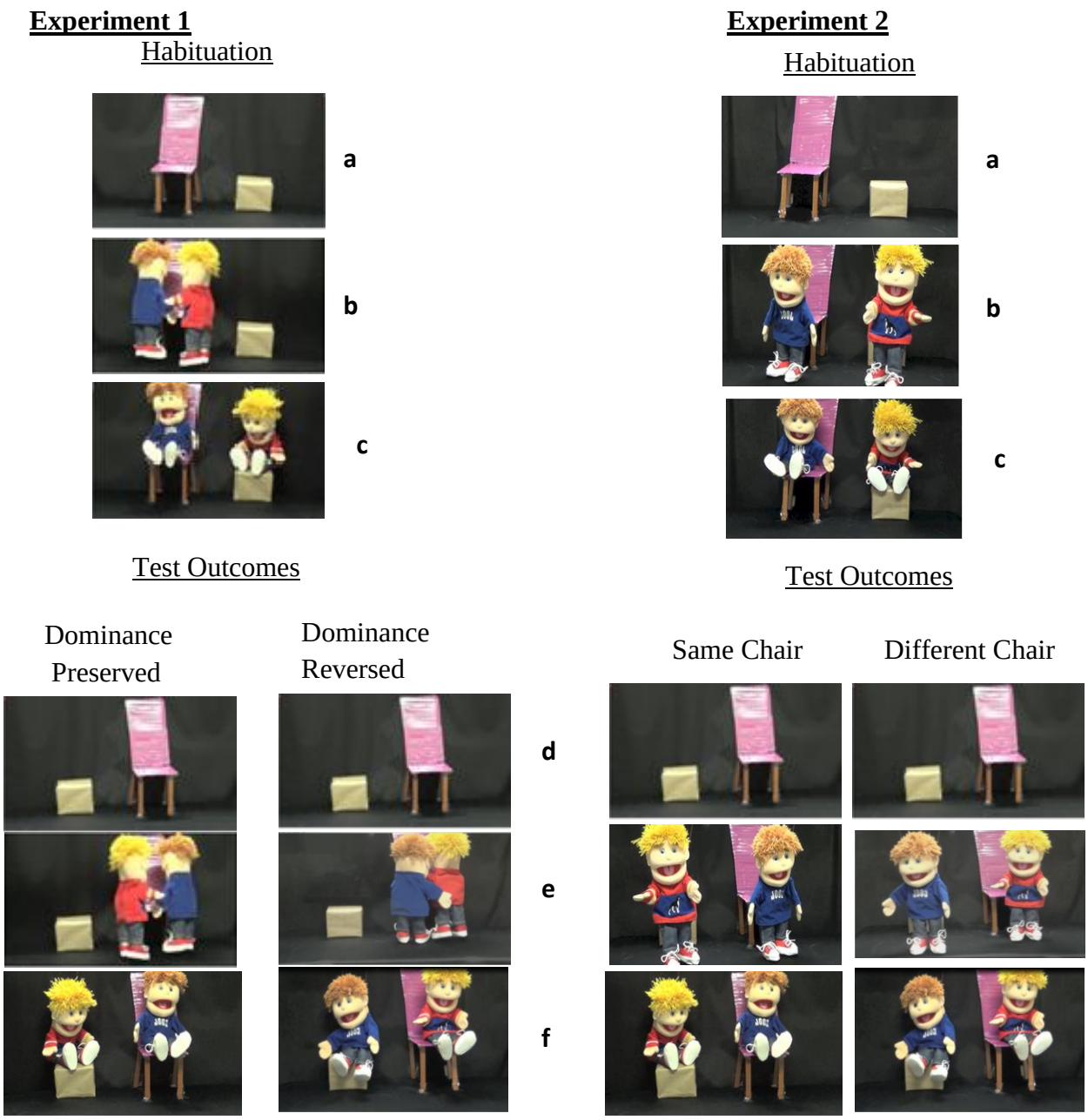

Figure 2.1. Habituation and Test Outcomes for Chapter 2, Experiments 1 and 2.

Experiment 1: During habituation, infants saw a brown stool and a more attractive purple chair (a). Then, infants saw two puppets enter from opposite sides of the screen and try to sit in the chair (b). After bumping into the chair three times, the submissive puppet bowed down and let the dominant puppet sit in the chair (c). At test, infants saw two videos that were analogous to the habituation videos with a few minor changes. In both videos the chair and stool appeared in reverse locations in comparison to habituation (d). In the Dominance Preserved outcome, the

sides of the puppets reversed and the dominance/submissive roles were preserved (e.g., the puppet that was dominant during habituation was also dominant in this test event) (e, f). In the Dominance Reversed Outcome, the sides of the puppets stayed the same, but the dominance structure reversed such that the previously submissive puppet was dominant and the previously dominant puppet was now submissive (e, f). **Experiment 2.** During habituation, again infants saw a brown stool and a more attractive purple chair (a). Then infants saw two puppets enter from opposite sides of the screen (b). There was no conflict and the puppets just sat on whatever object (i.e., chair or stool) that was closest to them (c). At test, infants saw two videos analogous to the habituation videos, with the chair and stool in reversed locations (d). In the Same Chair outcome the sides of the puppets switched, but the puppets sat on the same object as in habituation (e, f). In the Different Chair outcome the puppets switched which objects they sat on such that they were sitting on the opposite objects than habituation (e, f).

2.3.1.1 Coding

For all of the experiments, looking times were measured to the static outcomes of the habituation and test events by a primary online coder and a secondary offline coder both of whom were unaware of the particular events infants were watching. Coders used jHab, a computer program, (Casstevens, 2007) to indicate when infants attended to the event. When infants looked away from the event for one second the trial ended, and a new trial began[1]. The habituation criteria was met when summed looking on a consecutive set of three trials fell to 50% of summed looking on the first three trials. Additionally, for all experiments, there was a pre-set number of habituation trials such that infants needed to see a minimum of 6 trials during habituation, and at maximum 14 trials.

For the habituation outcomes interrater reliability was high, $r(108) = .99$, $p < .001$. For the test trial outcomes interrater reliability was also high, $r(30) = .99$, $p < .001$. The live coder and

[1] Pilot work suggested that a 1 second look-away criterion would lead to less attrition than a 2 second look-away criterion. Additionally, a 1 second look-away criterion has been used on other studies with 17-month olds (Graf Estes, Evans, Alibali, Saffran, 2007).

offline coder agreed on 93.75% of look aways (defined as the exact time that infants looked away from the screen to end the trial) for the test trials. In addition, an offline coder coded infants' attention to the habituation and test events themselves to ensure that infants attended to and encoded these events.

2.3.2 *Results*

2.3.2.1 Habituation Phase

On average, infants attended to the video 91.04% of the time during the habituation events. On average, infants took 6.88 trials to habituate (min = 6, max = 9; *SE* = .26). The mean looking time to the first 3 habituation outcomes was 31.85 seconds (*SE* = 4.82) and the mean looking time on the last 3 habituation outcomes was 12.43 (*SE* = 1.71). There was a significant decrease in attention from the first three habituation outcomes to the last three habituation outcomes, $t(15) = 5.65$, $p < .001$.

2.3.2.1 Test Phase

To ensure that infants attended equally to both videos, we compared infants' looking to the test videos. On average, infants attended to the video 89.37% of the time during the test videos. Infants' attended equally to the Dominance Reversed and Dominance Preserved test videos, $t(15) = .39$, $p = .70$.

In our main analysis, we compared infants' mean looking times to the Dominance Preserved outcome (the same puppet was dominant) and the Dominance Reversed outcome (the submissive puppet is now dominant) which is shown in Figure 2.2. As Figure 2.2 indicates, infants looked longer to the Dominance Reversed compared to the Dominance Preserved outcome, $t(15) = 2.31$, $p = .036$, $d = .82$. This provides initial evidence that infants detected the

dominance structure, and thus looked longer to the test event that disrupted versus preserved the dominance structure.

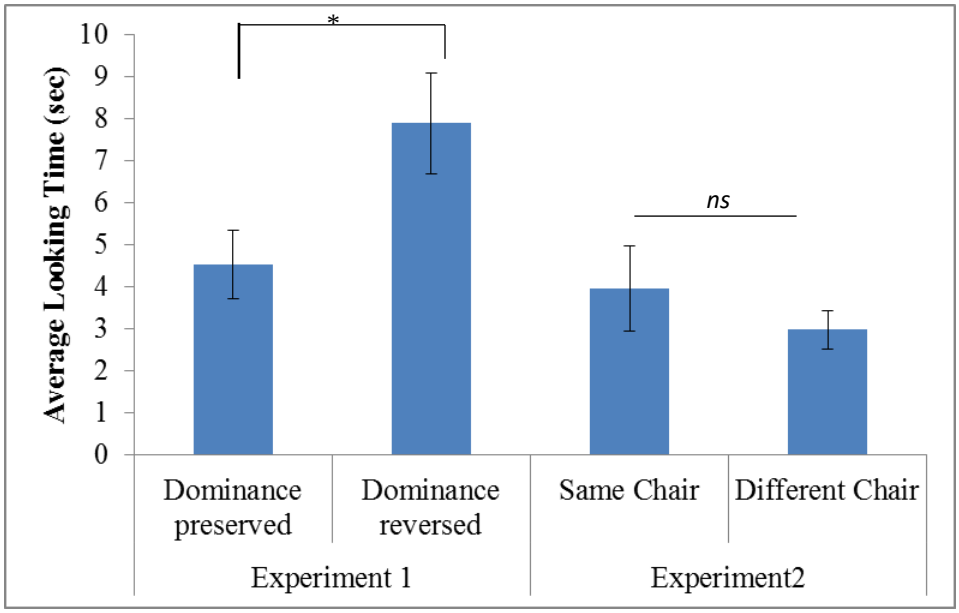

Figure 2.2. Average looking time to test outcomes for Chapter 2, Experiments 1 and 2. Error bars represent Standard Error.

2.3.3 *Discussion*

Experiment 1 showed that infants notice changes to the dominance structure. This is consistent with previous research findings (Mascaro et al., 2012; Thomsen et al., 2011) and extends these findings to a novel dominance context. However, in Experiment 1 it is possible that the results were driven not by infants' ability to detect changes in the dominance structure, but instead were based merely on infants' ability to detect changes in the objects the puppets were sitting on. If this were the case, infants may just look longer at the Dominance Reversed outcome because the objects the puppets sat on switched. To test for this possibility, Experiment 2 was conducted.

2.1 EXPERIMENT 2

In Experiment 2, infants watched videos in which each puppet sat on the different objects, but there were no dominance cues (i.e., Puppet A sat on the purple chair and Puppet B sat on the brown stool). During test trials, infants saw events where the puppets entered from opposite sides of the screen and sat on either the same objects as habituation (Same Chair Event: i.e. Puppet A would still sit on the purple chair and Puppet B would sit on the brown stool), or events in which the puppets entered from the same sides but sat on the opposite object (Different Chair Event: i.e. Puppet A would now be sitting on the brown stool and Puppet B would now be sitting on the purple chair). If in Experiment 2, infants looked longer to the Different Chair test outcomes than the Same Chair outcomes then this would suggest that the results of Experiment 1 were simply driven by infants noticing that the puppets changed what objects they sat on. In contrast, if infants look equally to both the Same Chair and Different Chair test outcomes these findings would suggest that their attention in Experiment 1 was driven by their ability to detect the change in dominance structure.

2.1.1 *Method*

2.1.1.1 Participants

Sixteen 17-month-old infants participated in Experiment 2 (*M* = 17 months, 10 days, range = 16 months, 28 days – 18 months, 5 days; 8 girls). Ten additional babies were tested but excluded from the experiment due to fussiness (*n* = 5), failure to habituate (*n* = 1), a procedural error (*n* = 2), and for looking more than 2.5 SD above the mean at test (*n* = 2). For 11 infants both parents had their bachelor's degree or higher, for 4 infants one parent had their bachelor's degree and the other had some college, and for 1 infant one parent had their bachelor's degree

and the other had a high school diploma. Of the participants, 13 were White, 1 was Hispanic, and 2 were Multiracial as identified by their parents.

2.1.1.1 Procedure

2.1.1.2 Habitation Phase

In the Habituation Phase, infants watched videos that did not include any displays of dominance. In these videos without any displays of dominance, the same two objects (ie. the purple chair and brown stool) that were in Experiment 1 were shown (see Figure 2.1a). The objects appeared first in the videos followed by two puppets who entered from opposite sides of the screen. Unlike in Experiment 1 where the puppets both approached and tried to sit in the attractive purple chair, in this experiment, both puppets simply approached the object they were closer to and stood in front of it (Figure 2.1b). After standing in front of the closer object for about 3 seconds, the puppets sat on the object (Figure 2.1c). The video then cut to a static frame (See Figure 2.1c). The total length of the video was about 6 seconds long.

2.1.1.1 Test Phase

Following habituation, infants viewed two test trials. In both videos, the chair and the stool switched sides (See Figure 2.1d). In the Same Chair test trial, the sides of the puppets were reversed and the same puppet that sat on the purple chair during habituation also sat on the purple chair during this test trial (e.g., Puppet A still sat on the purple chair and Puppet B still sat on the brown stool) (See Figure 2.1e, 2.1f). In the Different Chair test trial, the chairs the puppets sat on were reversed (e.g. if Puppet A sat on the purple chair during habituation, at test Puppet A sat on the stool, and Puppet B would now sit on the purple chair) (See Figure 2.1e, 2.1f). Again, the total length of the test videos was about 6 seconds long.

The side the puppets were initially on (left vs. right), the sides the objects were initially on (left vs. right), the puppet originally sitting in the purple chair (blond-haired vs. brown-haired), and test trial order (Same Chair vs. Different Chair) were all counterbalanced. Infants' looking time was measured in the same way as in Experiment 1.

2.1.1.1 Coding

For the habituation trial outcomes interrater reliability was high, $r(130) \approx 1.0$, $p < .001$. For the test trial outcomes interrater reliability was also high, $r(30) = .99$, $p < .001$. The live coder and offline coder also agreed on 100% of look aways on the test trials.

2.1.2 *Results*

2.1.2.1 Habituation Phase

On average, infants attended to the video 88.49% of the time during the habituation events. Infants on average took 8.25 trials to habituate (min = 6, max = 14; *SE* = .62). The mean looking time to the first 3 habituation outcomes was 22.69 seconds (*SE* = 2.34) and the mean looking time on the last 3 habituation outcomes was 8.72 seconds (*SE* = .91). There was a significant decrease in attention from the first three habituation outcomes to the last three habituation outcomes, $t(15) = 8.79$, $p < .001$.

2.1.2.1 Test Phase

On average, infants attended to the video 82.77% of the time during the test videos. To ensure that infants watched both test videos, we compared infants' attention to both test videos. Infants equally attended to the Same Chair and Different Chair test events, $t(15) = .44$, $p = .66$.

In our main analysis of interest, we compared infants' mean looking times to the Same Chair outcome (the puppets sat on the same chairs) and the Different Chair outcome (the puppets

sat on opposite chairs) which is shown in Figure 2. As Figure 2 indicates, infants looked at the Same Chair and Different Chair outcomes equally, $t(15) = .89$, $p = .39$, $d = .31$.

2.1.2.1 Comparing Experiment 1 and 2

We compared results from Experiment 1 and 2 to test whether infants' looking time differed as a function of whether dominance information was present (Experiment 1) or absent (Experiment 2) which would provide additional evidence that infants were not just responding to the puppets sitting in different chairs. An ANOVA was conducted with Test Outcome (Same Chair/Same Dominance Structure vs. Different Chair/Different Dominance Structure) as the within-subjects measure and Experiment (Exp1 vs. Exp2) as the between-subjects factor. There was no main effect of looking based on Test Outcome (Same Chair/Same Dominance Structure vs. Different Chair/Different Dominance Structure), $F(1, 30) = 1.70$, $p = .20$, $\eta^2 = .054$. There was a main effect of looking based on Experiment (Exp1 vs. Exp2), $F(1, 30) = 8.96$, $p = .005$, $\eta^2 = .023$ showing that infants looked longer at the test trial outcomes in Exp1 than the test trial outcomes from Exp2. Critically, however, and as predicted, the analysis revealed a significant interaction between Experiment and Test Outcome, $F(1, 30) = 5.65$, $p = .024$, $\eta^2 = .16$.

Follow-up analyses revealed that infants looked significantly longer at the Different Chair Outcome when dominance cues were displayed and the dominance structure changed in Experiment 1 than when the puppets just sat on different chairs and no dominance cues were present in Experiment 2, $t(30) = 3.83$, $p = .001$, $d = 1.35$. In contrast, infants looked equally at the Same Chair Outcome across experiments, $t(30) = .44$, $p = .67$, $d = .15$. These findings show that infants' attention varied as a function of whether dominance cues were present, and the differential looking based on the change in the dominance structure in Experiment 1 was due to the change in the Dominance Structure and not due to changing which chairs the puppets sat on.

Additionally, if it were the case that infants noticed the chair swap in Experiment 1 because they were more attentive than Experiment 2, they should have looked longer to the habituation events in Experiment 1. This was not the case, and across Experiments 1 and 2 infants attended equally to both displays, $t(30) = 1.29$, $p = .21$, $d = .46$.

2.1.3 *Discussion*

Experiment 2 provides evidence that infants did not attend more strongly to event outcomes in which the puppets switched chairs versus sat on the same chairs. Therefore, in Experiment 1, infants noticed the change in the dominance structure and were not just paying attention to the outcome of the events.

2.2 EXPERIMENT 3

Before we could test whether infants can integrate information about dominance into resource distributions, Experiment 3 sought to replicate and extend previous research showing that infants have a baseline expectation that resources are distributed equally to recipients (Geraci & Surian, 2011; Schmidt & Sommerville, 2011; Sloane, et al., 2012). The current experiment was novel in that we tested 17-month-old infants (a previously untested age group with this procedure), and featured events in which a person distributed resources to two puppets.

In the current experiment, before seeing equal and unequal resource distributions, infants watched the videos from Experiment 2 (no dominance cues) during habituation. Before testing our main hypothesis that infants' expectations about equality can be modulated by familiarizing infants with dominance information between the subsequent recipients involved in the resource distribution, it was important to establish that these expectations are not influenced by other aspects of familiarization. Because the habituation videos did not differentiate the puppets in

terms of their dominance status, we predicted that infants would expect equal resource distributions, mirroring past work (Geraci & Surian, 2011; Schmidt & Sommerville, 2011; Sloane, et al., 2012).

2.2.1 *Method*

2.2.1.1 Participants

Sixteen 17-month-old infants participated in Experiment 3 (*M* = 17 months, 13 days, range = 16 months, 25 days – 18 months, 11 days; 9 girls). An additional five infants were tested but were excluded from analyses due to not habituating (*n* = 2) and fussiness (*n* = 3). No infants were excluded due to procedural errors or looking 2.5 SD above or below the mean. Infants in the sample came from highly educated families, for 15 infants both parents had their bachelor's degree or higher, and for 1 infant one parent had their bachelor's degree and the other had some college. Of the participants, 10 were White, and 6 were Multiracial as identified by their parents.

2.2.1.1 Procedure

2.2.1.2 Habituation Phase

In the Habituation Phase infants viewed the videos that did not display any dominance information where one puppet sat on a more attractive chair and the other puppet sat on the less attractive stool. These were the same videos that were shown in Experiment 2 during habituation (see Figure 2.1a-c).

2.2.1.1 Test Phase

Following habituation, infants viewed two test trials. During these test trials, infants watched distribution videos that ended in either an equal distribution (Equal Test Event) or a distribution that favored the puppet sitting in the more attractive chair (Unequal Favors

Attractive Test Event). In the Equal Test Event, infants first saw a male actor seated in between the two puppets that were in the habituation videos. Each puppet was holding a black plate. The experimenter first said "hi" to both of the puppets, and the puppets waved their hands in response (Figure 2.3a). The actor then brought out a clear bowl that contained four red Legos and said "Wow" (2.3b). The puppets then moved closer to the actor and the actor distributed two Legos to the puppet who sat on the more attractive chair in the previous videos while saying "here" (2.3c) and then distributed two Legos to the puppet who sat on the less attractive stool in the previous videos while saying "here" (2.3d). After distributing all of the Legos, the actor lifted up the empty bowl and said, "There, All gone" (2.3e). The infants than viewed the actor holding up the empty bowl and smiling at the camera for one second (2.3e). Then, the video cut to a freeze frame where the actor's face was covered by a black box so that the infants would focus on the distribution outcome (2.3f). Infants' looking was measured to this outcome.

In the Unequal Favors Attractive Test Event, the same sequence of events occurred as in the Equal Test Event (Figure 2.3a-b) but instead of distributing the Legos equally, the actor distributed the Legos unequally such that the puppet who previously sat on the attractive chair received three Legos (2.3c) and the puppet that previously sat on the less attractive stool received one Lego (2.3d). Just as in the equal videos, after the distribution, the actor lifted up the empty bowl and said, "There, All gone" (2.3e), and the infants viewed the actor holding up the empty bowl while smiling at the camera for one second. Following the event, the video cut to a freeze frame where again, the actor's face was covered by a black box so that the infants would focus on the distribution outcome (2.3f). Infants' looking was measured to this static outcome. The total length of the test videos were about 22 seconds long.

The side the puppets were initially on (right vs. left), the sides the chairs were initially on (right vs. left), the puppet originally sitting in the purple chair (blond-haired vs. brown-haired), and test trial order for the first two test trials (Equal vs. Unequal Favors Attractive) were all counterbalanced. Infants' looking was measured to the outcomes.

Distributions and Test Outcomes

Equal Distribution

a **b** **c** **d** **e** **f**

Unequal Distribution

a **b** **c** **d** **e** **f**

Figure 2.3. Distribution videos for Chapter 2, Experiments 3-5.

In the distribution videos, a distributor is shown between two puppets (a). Then, the distributor brings out a bowl of resources (b), and gives resources to one puppet (c- gives two resources in the equal distribution or three resources in the unequal distribution) before giving resources to the other puppet (d- gives two in the equal distribution or one resource in the unequal distribution). The distributor then holds out his empty bowl (e). The video then cuts to a freeze frame focusing only on the puppets to show the number of resources each puppet received (f). In the Unequal Test Event, the favored puppet was either the puppet who sat on the more attractive chair (Exp 3: Unequal Favors Attractive), the Dominant puppet (Exp 4: Unequal Favors Dominant), or the Submissive Puppet (Exp 5: Unequal Favors Submissive).

2.2.1.1 Coding

For the habituation trial outcomes interrater reliability was high, $r(151) = .99$, $p < .001$. For the test trial outcomes interrater reliability was also high, $r(30) = .99$, $p < .001$. The live coder and offline coder also agreed on 100% of look aways on the test trials.

2.2.2 *Results*

2.2.2.1 Habituation Phase

On average, infants attended to the video 85.11% of the time during the habituation events. Infants on average took 9.56 trials to habituate (min = 6, max = 14; *SE* = .70). The mean looking time to the first 3 habituation outcomes was 23.59 seconds (*SE* = 3.68) and the mean looking time on the last 3 habituation outcomes was 9.20 seconds (*SE* = 1.36). There was a significant decrease in attention from the first three habituation outcomes to the last three habituation outcomes, $t(15) = 5.84$, $p < .001$.

2.2.2.1 Test Phase

On average, infants attended to the video 98.32% of the time during the test videos. To ensure that infants watched both test videos, we compared infants' looking to the videos. Infants equally attended to the Equal and Unequal Test Events, $t(15) = .40$, $p = .69$.

In the main analysis, we compared infants' mean looking times to the Equal Outcome (both puppets received an equal number of resources) and the Unequal Favors Attractive Outcome (the puppet who sat on the more attractive chair during habituation received more resources than the puppet who was sitting on the brown stool) which is shown in Figure 2.4. As Figure 2.4 indicates, infants looked significantly longer at the Unequal Favors Attractive Outcome, $t(15) = 2.44$, $p = .028$, $d = .60$.

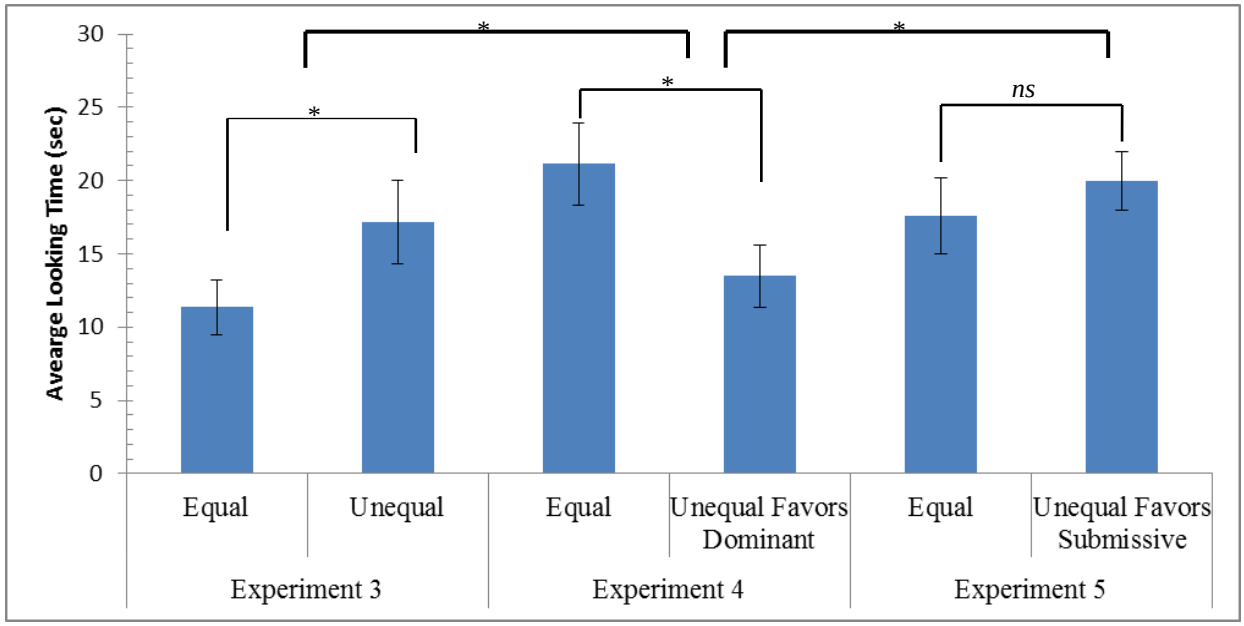

Figure 2.4. Average looking time to test outcomes for Chapter 2, Experiments 3, 4, and 5. Error bars represent Standard Error.

2.2.3 *Discussion*

Experiment 3 replicates and extends past studies showing that infants expect equality and look longer to unequal versus equal outcomes in the absence of differentiating information about the recipients (Geraci & Surian, 2011; Schmidt & Sommerville, 2011; Sloane, et al., 2012).

Experiment 3 also showed that the mere presence of familiarity with the recipients and any of their actions (e.g., sitting in chairs that differ in salience) do not change infants' expectations about the outcomes of resource distributions in the absence of information about relative dominance between the recipients. After seeing a video in which the puppets occupied different chairs prior to the resource distribution, infants expected resources to be distributed equally to recipients. Knowing that 17-month-old infants also expect equality when there are no differences in dominance status, we proceeded to test whether infants' expectations about resource distribution can be modulated by information about the dominance structure between the recipients.

2.3 EXPERIMENT 4

In the current experiment we hypothesized that infants would integrate prior information about the recipients such that infants would expect someone who is dominant to subsequently receive more resources than someone who is submissive. Not only would this provide further evidence that infants are sensitive to the dominance structure, this would also show that infants expect dominance to have downstream consequences for resource allocations.

To test whether infants deviate from expecting equality given dominance information, we had infants view the same dominance videos as in Experiment 1 during habituation trials. After habituating to a video in which one puppet was portrayed as dominant and one puppet was portrayed as submissive, infants watched an Equal and Unequal Distribution Event (as in Experiment 3). If the dominance information does not influence infants' expectations about resource distribution, infants should look longer at an outcome in which the dominant individual is favored compared to an equal outcome. If, however, the dominance information leads infants to suspend expectations of equality, then infants should look longer at the equal outcome compared to the outcome that favors the dominant individual. We hypothesized that infants would incorporate the dominance structure into their expectations about resource distributions and therefore look longer at the equal outcome.

2.3.1 *Method*

2.3.1.1 Participants

Sixteen 17-month-old infants participated in Experiment 4 (*M* = 17 months, 8 days, range = 16 months, 28 days – 18 months, 5 days; 7 girls). Ten additional babies were tested but were not included in the final sample due to fussiness (*n* = 6), failure to habituate (*n* = 3), and a procedural error (*n* = 1), no infants were excluded due to looking 2.5 SD above or below the

mean. Of the parents who had participating infants, for 12 infants both parents had their bachelor's degree or higher, for 3 infants one parent had their bachelor's degree and the other had some college, and for 1 infant their sole parent had their high school diploma. Of the participants, 14 were White, and 2 were Multiracial as identified by their parents.

2.3.1.1 Procedure

2.3.1.2 Habituation Phase

In the Habituation Phase, infants viewed videos that portrayed dominance. These were the same videos that were shown in Experiment 1 (see Figure 2.1a-c). Infants watched the dominance videos until they habituated.

2.3.1.1 Test Phase

Following habituation, infants viewed two test trials. During these test trials, infants watched distribution videos that ended in either an equal distribution (Equal Test Event) or a distribution that favored the dominant puppet (Unequal Favors Dominant Test Event). These videos were the exact same videos used in Experiment 3.

In the Equal test trial, the distributor gave 2 Legos to the Dominant puppet and 2 Legos to the Submissive Puppet. In the Unequal Favors Dominant test trial, the distributor gave 3 Legos to the Dominant puppet and 1 Lego to the Submissive Puppet (Figure 2.3a-f). Infants' looking was measured to the static outcome.

The side the puppets were initially on (right vs. left), the sides the chairs were initially on (right vs. left), the dominant puppet (blond-haired vs. brown-haired), and test trial order for the first two test trials (Equal vs. Unequal Favors Dominant first) were all counterbalanced.

2.3.1.1 Coding

For the habituation trial outcomes interrater reliability was high, $r(125) = .99$, $p < .001$. For the test trial outcomes interrater reliability was also high, $r(30) = .99$, $p < .001$. The live coder and offline coder also agreed on 97% of look aways on the test trials.

2.3.2 *Results*

2.3.2.1 Habituation Phase

On average, infants attended to the video 84.90% of the time during the habituation events. Infants on average took 7.94 trials to habituate (min = 6, max = 14; *SE* = .61). The mean looking time to the first 3 habituation outcomes was 31.56 seconds (*SE* = 4.91) and the mean looking time on the last 3 habituation outcomes was 10.48 (*SE* = 1.67). There was a significant decrease in attention from the first three habituation outcomes to the last three habituation outcomes, $t(15) = 5.76$, $p < .001$.

2.3.2.1 Test Phase

On average, infants attended to the video 98.37% of the time during the test videos. To ensure that infants attended equally to both videos, we compared infants' looking to the test videos. Infants equally attended to the Equal and Unequal Favors Dominant test videos, $t(15) = .16$, $p = .88$.

In our main analysis, we compared infants' mean looking times to the Equal Outcome (both puppets received an equal number of resources) and the Unequal Favors Dominant Outcome (the dominant puppet received more resources than the submissive puppet) which is shown in Figure 2.4. As Figure 2.4 indicates, infants looked significantly longer at the equal outcome, $t(15) = 2.54$, $p = .022$, $d = .88$.

2.3.2.1 Comparing Experiment 3 and 4

We compared results from Experiment 3 and 4 to examine infants' overall expectations about resource distributions in the absence and presence of dominance information. An ANOVA was conducted with Test Outcome (Equal vs. Unequal) as the within-subjects measure and Experiment (Exp3 vs. Exp4) as the between-subjects factor. There was no main effect of looking based on Test Outcome (Equal vs. Unequal), F (1, 30) = .23, p = .64, η^2 = .008 nor a significant main effect of looking based on Experiment (Experiment3 vs. Experiment4), F (1, 30) = 1.12, p = .30, η^2 = .036. Critically, however, and as predicted, the analysis revealed a significant interaction between Experiment and Test Outcome, F (1,30) = 12.30, p = .001, η^2 = .291.

Follow-up analyses revealed that infants looked significantly longer at the Equal Outcome in Experiment 4 (when equal resources were given to the dominant and submissive puppets) compared to Experiment 3 (when equal resources were given to the puppets and neither puppet was dominant over the other), t(30) = 2.91, p = .007, d = 1.03. Comparing the Unequal Test Outcomes across the experiments, there were no differences in infants' looking across experiments to the Unequal Test Outcomes, t(30) = 1.03, p = .31, d = .37. These findings show that infants' attention to inequality varied as a function of whether they previously viewed videos depicting dominance information. Thus, infants expected equality when no dominance information was previously provided, but when they learned about differences in dominance, they did not expect equality.

2.3.3 *Discussion*

Experiment 4 provides initial evidence that given information about the dominance structure between two recipients, infants overturned their equality expectation and instead expected an unequal distribution. This indicates that infants may expect resources to be

distributed in a way that is consistent with the dominance structure. Comparing the results of Experiments 3 and 4 revealed that infants had different expectations for resource distributions based on dominance information about the recipients. Infants' attention to the equal outcome varied based on whether there was no information about dominance hierarchies or whether one puppet was previously portrayed as dominant over the other puppet. Overall, these two experiments provide support that infants use information about the dominance structure to form expectations about how resources are or should be distributed.

An alternate reading of the findings of Experiment 4 is that infants may not have specifically formed expectations that the dominant puppet will receive more than the submissive puppet, but instead may have just had an expectation that resources will be distributed unequally, in either direction, when provided with prior dominance information. To differentiate between these possibilities, Experiment 5 was conducted.

2.4 Experiment 5

In Experiment 5 we tested to see whether infants merely expect general inequality after viewing dominance information, or whether they specifically expect a resource distribution to be aligned with the dominance structure. Thus, as in Experiment 4, infants saw the dominance videos during Habituation (same as Experiment 1 and 4), followed by Equal or Unequal distribution test trials. The critical difference was that in the Unequal distribution event, the submissive puppet received more Legos (3) than the dominant puppet (1).

Our questions in Experiment 5 were twofold. First, we wanted to investigate whether infants would view an outcome in which the submissive puppet was advantaged by the distribution as less expected than an equal outcome (leading to longer looking to the event that favored the submissive puppet), or whether they would see both types of events as relatively

unexpected (leading to equivalent looking times). Second, we wanted to investigate whether infants would see inequality that favors the submissive recipient as more unexpected than an inequality that favors the dominant recipient. If infants vary their attention as a function of the nature of the inequality, this would provide compelling evidence that infants are linking dominance structures to resource distributions.

2.4.1 *Method*

2.4.1.1 Participants

Sixteen 17-month-old infants participated in Experiment 5 (*M* = 17 months, 17 days, range = 17 months, 4 days – 18 months, 10 days; 9 girls). There were eight infants who were excluded from analyses due to fussiness (*n* = 4) and for failing to habituate (*n* = 4). No infants were excluded due to procedural errors or looking 2.5 SD above or below the mean at test. For 12 infants both parents had their bachelor's degree or higher, for 1 infant one parent had their bachelor's degree and the other had some college, for 1 infant both parents had some college, for 1 infant 1 parent had a bachelor's degree, and for 1 infant 1 parent had some college. Of the participants, 14 were identified as White, and 2 were identified as Multiracial by their parents.

2.4.1.1 Procedure

2.4.1.2 Habituation Phase

In the Habituation Phase, infants viewed videos that portrayed dominance. These were the same videos that were shown in Experiment 1 and Experiment 4 (see Figure 2.1a-c). Infants watched the dominance videos until they habituated.

2.4.1.1 Test Phase

Following habituation, infants viewed two test trials. During these test trials, infants watched distribution videos that ended in either an equal distribution (Equal Test Event) or an unequal distribution in which the submissive puppet received more resources (Unequal Favors Submissive Test Event). The test events were exactly the same as Experiment 4 except in the Unequal Favors Submissive Test Event, the puppet that was submissive during the dominance videos received more resources than the dominant puppet (see Figure 2.3a-f). As in Experiment 4, after the distribution of resources occurred, the videos cut to a freeze frame where the actor's face was covered by a black box so that the infants would focus on the distribution outcome (2.3f) and infants' looking was measured to this outcome.

Again, the side the puppets were initially on (right vs. left), the sides the chairs were initially on (right vs. left), the puppet originally sitting in the purple chair (blond-haired vs. brown-haired), and test trial order for the first two test trials (Equal vs. Unequal Favors Submissive first) were all counterbalanced. Infants' looking time was measured in the same way as in Experiment 1, 2, 3, and 4.

2.4.1.1 Coding

For the habituation trial outcomes interrater reliability was high, $r(127) = .99$, $p < .001$. For the test trial outcomes interrater reliability was also high, $r(30) = .99$, $p < .001$. The live coder and offline coder also agreed on 94% of look aways on the test trials.

2.4.2 *Results*

2.4.2.1 Habituation Phase

On average, infants attended to the video 86.18% of the time during the habituation events. Infants on average took 8.06 trials to habituate (min = 6, max = 14; *SE* = 2.72). The mean

looking time to the first 3 habituation outcomes was 28.24 seconds (*SE* = 3.17) and the mean looking time on the last 3 habituation outcomes was 9.69 seconds (*SE* = 1.22). There was a significant decrease in attention from the first three habituation outcomes to the last three habituation outcomes, $t(15) = 8.39$, $p < .001$.

2.4.2.1 Test Phase

On average, infants attended to the video 97.62% of the time during the test videos. To ensure that infants attended equally to both videos, we compared infants' looking to the test videos. Infants equally attended to the Equal and Unequal Favor Submissive Test videos, $t(15) = .28$, $p = .78$.

In our main analysis, we compared infants' mean looking times to the Equal Outcome (both puppets received an equal number of resources) and the Unequal Favors Submissive Outcome (the submissive puppet received more resources than the dominant puppet) which is shown in Figure 2.4. As Figure 2.4 indicates, infants looked equally long at the Equal Outcome and the Unequal Favors Submissive Outcome, $t(15) = 1.22$, $p = .24$, $d = .26$.

2.4.2.1 Comparing Experiment 4 and 5

To determine infants' overall expectations for equality, favoring the dominant individual, and favoring the submissive individual, Experiment 4 and 5 were compared. An ANOVA was conducted with Test Outcome (Equal vs. Unequal) as the within-subjects measure and Experiment (Exp4 vs. Exp5) as the between-subjects factor. There was no main effect of looking based on Test Outcome (Equal vs. Unequal), $F(1, 30) = 2.14$, $p = .15$, $\eta^2 = .067$ nor a significant main effect of looking based on Experiment (Experiment 4 vs. Experiment 5), $F(1, 30) = .26$, $p = .61$, $\eta^2 = .009$. Critically, however, and as predicted, the analysis revealed a significant interaction between Experiment and Test Outcome, $F(1,30) = 7.81$, $p = .009$, $\eta^2 = .206$.

Follow-up analyses revealed that infants looked for similar amounts of time at the Equal Test Outcomes across experiments, $t(30) = .93$, $p = .36$, $d = .33$. Comparing the Unequal Test Outcomes across the experiments, infants looked significantly longer at the Unequal Favors Submissive Outcome compared to the Unequal Favors Dominant Outcome, $t(30) = 2.23$, $p = .034$, $d = .79$. These findings show that infants' attention to inequality varied as a function of who is being favored. Thus, rather than a having a general association between dominance structure and unequal distribution of resources, infants specifically expected the dominant puppet to receive more resources than the submissive puppet.

2.4.3 *Discussion*

Overall, Experiment 5 showed that infants' expectations for the equal outcome and the outcome in which the submissive puppet was favored were equivalent; infants' looking to these two types of outcomes did not differ significantly. Comparing the results of Experiments 4 and 5 revealed that infants expected the dominant puppet to be favored in the resource distribution over the submissive puppet. Infants' attention to the unequal outcome varied based on whether the favored recipient was dominant or submissive. Overall, these two experiments provide support that infants use information about the dominance structure to form expectations about how resources are or should be distributed.

2.5 General Discussion

2.5.1 *Summary and Implications of the Current Findings*

The critical question addressed in the current experiments was whether infants' expectations about resource distributions can be modulated by the dominance structure between the recipients. First, we replicated prior results that 17-month-old infants can detect social

dominance (Experiments 1 and 2), and that infants have a baseline expectation for equality in the absence of relevant background information about recipients (Experiment 3). We then asked whether infants expect a dominant individual to receive more resources than a submissive individual in a resource distribution event (Experiments 4 and 5). Our findings suggest that infants expect resource distributions to reflect the dominance hierarchy. After learning that one puppet was dominant and the other submissive, infants expect not only that resources will be distributed unequally, but also expect that unequal distributions will favor the dominant puppet over the submissive puppet. Prior work has demonstrated that preschool-age children explicitly expect dominant individuals to possess more resources than their submissive counterparts (Charafeddine et al., 2015); our findings add important new information to the literature by demonstrating that even at 17 months of age, infants expect resource distributions to align with the dominance structure.

Prior work has shown that infants readily infer and represent social dominance (Gazes et al., 2015; Mascaro & Csibra, 2012; Mascaro & Csibra, 2014; Thomsen et al., 2011). Our results extend these findings, showing how such representations might be used; infants used dominance information to form expectations about who will receive more resources, and who will receive less. In addition, our results may extend our knowledge of the flexibility of infants' expectations about resource distributions themselves. Previous research has shown that when infants receive either no background information about recipients, or irrelevant background information, infants expect resources to be distributed equally to recipients (Geraci & Surian, 2011; Schmidt & Sommerville, 2011). In addition to replicating these results in Experiment 3, our work critically demonstrates that infants do not always expect equality in resource distributions; after learning that one puppet was dominant and another submissive, infants expected resource distributions to

be *unequal*. A recent study found that infants suspended expectations about equal resource distributions when the two recipients contributed unequal amounts of work (Sloane et al., 2012). Consistent with this, the current findings also suggest that infants are not merely employing an equality heuristic to form expectations regarding how resources are distributed but can adjust their expectations flexibly based on the information at hand. Our findings suggest that infants may use information about a recipient's rank in the social hierarchy, or social status, to inform their expectations about resource distributions.

Interestingly, recent work suggest that young preschoolers, but not older preschoolers, tend to explicitly default to an equality norm even when there are legitimate reasons to justify departure from this norm – such as differences in need, merit and agreed-upon rules or systems of resource allocation (Schmidt, Svetlova, Johe, & Tomasello, 2016). There are several reasons why the findings may differ across studies. First, Schmidt et al. (2016) assessed explicit behavior and expectations whereas our work investigated infants' implicit expectations. Second, when, and the extent to which, children can take into account background information to reason about resource distributions may depend on the type of information provided about recipients. It may be the case that certain types of information (i.e., dominance) are easier to reason about than others (i.e., need). Or, perhaps more broadly, it may be the case that children more readily incorporate information about recipients that is constant and unchanging (i.e., an individual's social status) before they can incorporate transient, situational information (i.e., an individual's current need). Future work can distinguish these possibilities.

Although past work has defined or operationalized resource distribution in terms of particular acts or events in which resources are visibly allotted to others, it is important to point out that our results may not strictly apply to acts of witnessed resource allocation, but instead are

consistent with a more inclusive definition of resource distribution. Specifically, our definition does not necessarily refer to any specific process by which goods are divided or given out to different individuals; it just refers to the statistical state of something being (or having been) distributed. In our experiments, it could be that infants formed expectations based on the *process of distributing resources* such that they expected a third party to give more to dominant individuals. Another possibility is that infants may have formed expectations based on *resource possession*. From this perspective, infants in our experiments could have ignored the distribution events and focused only on the outcomes and the fact that one puppet possessed more resources than the other puppet. In line with this possibility, past work has shown that children expect dominant individuals to *possess* more resources than submissive individuals (Charafeddine et al., 2015). Therefore, it may not be surprising that infants have similar expectations. Future work can seek to determine whether infants at this age hold expectations about the *process by which resources are distributed* across individuals (e.g., the distributor's behavior) or the state of *resource possession* by individuals.

2.5.2 *Are Infants Representing Dominance Per Se?*

Another question regarding the current findings and past work is how infants are representing "dominance" displays used in various experimental paradigms. Because these displays contain multiple behaviors that provide rich information about agents and their social interactions, it is possible that infants are attributing other properties in addition to (or even instead of) dominance. For example, infants may not be representing the actors in these events in terms of dominance but may instead represent the actors in terms of competence and incompetence. In this set of experiments, infants saw two puppets trying to achieve a goal of sitting in a more attractive chair. One puppet achieved the goal and the other did not;

accordingly, infants may have construed one puppet as more competent at achieving his goal than the other puppet. Similarly, in Mascaro & Csibra's (2012) stimuli, the "dominant" agent successfully collected more objects than the "submissive" agent. Again, it is possible that instead of construing the agents in terms of their relative dominance, infants could see the agent who collects the resources as more competent than the agent that does not collect the resources. This interpretation could also apply to Thomsen et al.'s (2011) work, where one agent succeeds in crossing a platform, whereas the other does not, which could lead to differing attributions of competence to the agents.

Another alternative is that infants may view "dominance" stimuli in terms of differences in persistence between the two actors. In our stimuli, the submissive puppet relinquished his goal of sitting in the chair in favor of the dominant puppet, so infants may have viewed the submissive puppet as less persistent than the dominant puppet. Similarly, in Pun et al.'s (2016) work, when the submissive agent bows down to let the dominant agent cross the platform the submissive agent could be seen as less persistent than the dominant agent. Taken together, a review of these stimuli suggests that it is possible that infants are construing dominance displays in terms of other traits (i.e., competence or persistence).

It could also be the case that infants are representing dominance, competence and/or persistence concurrently. In fact, several authors have suggested that attributions of dominance, competence, and persistence may not be mutually exclusive such that dominant individuals are more likely to be competent (Hawley, 2007). It is possible that (1) representations of individual traits (competence) precede and support group-level representations like dominance, (2) dominance representations lead to additional individual trait attributions like competence, or (3) they are genuinely inter-related and emerge simultaneously from these displays. The relations

between these concepts might also depend on specific features of stimuli (e.g., Thomsen et al., 2011 varied the size of agents; Mascaro and Csibra 2012; 2014 had agents either fail or succeed in achieving their goals; which could have provided explicit cues to individual competence/persistence). Discerning these possibilities — whether an understanding of competence supports reasoning about dominance (and vice versa) and what infants are actually evaluating— is an important question for future research. Distinguishing these concepts will also help us better understand which one of these possibilities plays a critical role in various social judgments like resource distribution, moral evaluation, and social learning.

2.5.3 *What Mechanisms Underlie Infants' Expectations for Dominant Individuals?*

A critical open question concerns the nature of the representations and mechanisms supporting infants' performance on our task. One explanation for our findings is that infants form preferences for dominant over submissive individuals based on their ability to prevail in a competition to achieve a goal during the habituation phase. At test, infants may not specifically recall the dominance information, but instead merely remember that they liked one puppet more than the other, and therefore expect that puppet to receive more resources than the other puppet. Similar explanations have been advanced to account for children's tendency to positively evaluate certain individuals (Olson, Dunham, Dweck, Spelke, & Banaji 2008.) However, because infants are capable of remembering dominance information in a novel setting (Experiments 1 and 2) we believe this explanation is unlikely.

Another explanation for the current results is that infants may be picking up on statistical regularities they see in the world. Infants who are exposed to real world manifestations of dominance, such as adults, older children, or siblings acquiring more resources (i.e. snacks or toys) than younger and smaller children, may learn that dominant individuals often receive more

resources than submissive individuals. If infants frequently see outcomes where dominant individuals receive more than submissive individuals, they could pick up on these regularities using statistical patterns and anticipate an unequal distribution of resources that favors dominant individuals (Vapnik, 2013).

Future work can seek to disentangle these possibilities. To investigate whether infants merely associate dominant individuals with more resources based on past experience without understanding the causal connections between dominance and resource advantage, infants could be tested using paradigms that enable them to evaluate the outcome of resource distributions that either mirror or do not mirror the dominance structure. For example, future experiments could adopt a method developed by DesChamps, Eason, and Sommerville (2015). Using an adaption of an intermodal matching paradigm called the Valenced Association Task (VAT), DesChamps et al. (2015) demonstrated that infants as young as 13 months of age associate praise and admonishment with fair distributors (i.e., distributors that previously allocated resources equally to recipients), and unfair distributors (i.e., distributions that previously allocated resources unequally to recipients), respectively. Extending this paradigm to the current question of interest, we could ask whether infants associate distributors that favor dominant individuals with positive stimuli, and distributors that favor submissive individuals with negative stimuli.

Another possibility is that infants represent dominance and resource receipt at a more abstract level. For example, infants may possess an abstract understanding of relational logical operators such that they expect someone with “more” power to have “more” resources. Although this is an interesting possibility, this interpretation would require a somewhat rich interpretation of infants’ ability to form abstract understandings of relational logical operators. In order to track more/less across domains, infants would need to recognize and map quantity from an abstract

concept (power) to resource quantity. In fact, research within infants' understanding of number has suggested that there are distinct representational systems for tracking number (Hyde & Spelke, 2011) which suggests that forming abstract representations of "more" or "less" across different numeric systems, alone, may be challenging for infants. Therefore, it seems less likely that infants have a means for representing more or less that bridges both numeric and non-numeric domains.

2.5.4 *Future Directions*

One important outstanding question for future work concerns the scope of infants' understanding of social dominance and what cues of dominance infants are sensitive to. In our videos, infants had to rely on the dominance cues such as the conflict over the chair, the submissive agent bowing down, and the dominant agent obtaining the more desirable chair which provides support that infants can construe dominance based on cues such as prevailing in a goal and bowing down (See also Mascaro & Csibra, 2012 for example). Children also rely on a variety of cues to infer dominance. For instance, Charafeddine and colleagues (2015) found that children infer dominance based on which agent issues directions or instructions and which agent follows these directions. Brey and Shutts (2015) found that children are sensitive to non-verbal cues such as head tilt and eyegaze that portray dominance. Subsequent work can ask whether infants can also use these cues to infer social dominance.

Additionally, future research can assess whether infants consider other consequences of dominance (besides receiving more resources). For instance, in the adult literature, dominance has been linked to stereotypes about personality traits such that adults believe that dominant individuals are more likely to be capable, ambitious, and intelligent (Oldmeadow & Fiske, 2007) as well as affiliative benefits, such as having more friends or a broader social network (Dion,

Berscheid, & Walster, 1972). Researchers could test whether infants and children expect dominant individuals to hold these traits and have these benefits. Furthermore, following recent work showing toddlers hold a competent agent more reprehensible than an incompetent agent when both refused to help someone (Jara-Ettinger, Tenenbaum, & Schulz, 2015); researchers could ask whether young children also expect more dominant agents to hold more moral obligations to help others.

2.5.5 *Broader Implications*

Studying the developmental origins of infants' understanding of dominance, expectations regarding resource distributions, and how these processes interact could help to inform classic and contemporary issues in the field more broadly construed. One pressing question in the social psychology literature concerns whether egalitarian values (belief that resources and outcomes should be equal) or social dominance values (beliefs that resources and outcomes should be distributed based on the basis of hierarchies) are more fundamental or privileged in human social reasoning (Rand et al., 2013; Van Berkel, et al., 2015). By testing young infants, we can determine whether infants initially expect equality in the context of resource distributions, even in the context of information about the social dominance about the recipients, or whether information about social dominance is integrated into infants' expectations about resource distributions as soon as they form expectations about how resources will be distributed.

2.5.6 *Conclusions*

The current experiments demonstrated that infants use social dominance information to modulate their expectations about who will receive or have more resources: infants expect dominant individuals to receive or have more resources than submissive individuals. Taken

together with prior findings (Gazes et al., 2015; Mascaro & Csibra, 2012; Mascaro & Csibra, 2014; Thomsen et al., 2011), this work provides converging evidence that the ability to represent social dominance is part of infants' foundational social skills that allow them to make predictions about outcomes of social events. Moving beyond past work, our findings suggest that even early in life, humans can represent how particular outcomes, in this case receipt of resources, are associated with social dominance status. Thus, infants possess flexible and generative expectations about cues that define social hierarchies, and how social hierarchies align with resource allocations.

Chapter 3. TODDLERS USE WEALTH INFORMATION TO GUIDE THEIR HELPING BEHAVIOR

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3.1 ABSTRACT

Within the second year of life, toddlers help others in a variety of situations. Although this helping behavior is well documented, less is known about the *motivations* underlying early helping. Across three experiments we found evidence that 18-month-old toddlers prioritize personal costs and benefits over others' needs when deciding who to help. In Experiment 1 we found that toddlers were significantly more likely to help resource-rich over resource-poor people suggesting that toddlers may consider affiliative benefits when helping. In Experiment 2 we found that when the cost to helping resource-rich people was increased, toddlers modified their helping behavior to help resource-poor people who were easier to help. In Experiment 3 we found additional evidence that toddler prioritize reducing personal costs and seek to minimize physical effort when helping. Taken together these studies found that others' needs are not the primary motivation for choosing who to help. Instead, toddlers prioritize their own costs and benefits.

3.1 Chapter 3 Introduction

Prosocial behaviors (i.e., behaviors that serve to benefit others) are prolific: we donate money to charity, volunteer our time at soup kitchens, and hold doors open for strangers. The question remains, however, *why* we are prosocial. This is a particularly difficult question to answer because prosocial behavior is often multiply determined. Take, for example, a situation in which one's boss drops her pen, and her subordinate picks it up for her. One reason the subordinate may have helped was to alleviate her boss's need. Alternately, or additionally, the subordinate may help due to a desire to affiliate with her boss, or even to ingratiate herself to her boss. Past research suggests that both motivations can drive prosocial behavior. Adults and children are more likely to help people who have more need over individuals who have less need (Brañas-Garza, 2006; Li, Spitzer, Olson, 2014; Paulus, 2019). In addition, a desire to affiliate with some individuals over others also drives adults' and children's prosocial behavior: adults and children are more likely to share with friends over non-friends and strangers (Brañas-Garza, Durán, & Espinosa, 2012; Moore, 2009; Olson & Spelke, 2008) and are more likely to help people who are members of their own group over non-group members (Penner, Dovidio, Piliavin, & Schroeder, 2005; Plötner, Over, Carpenter, & Tomasello, 2015).

Although prosocial behavior is likely motivated by many factors, the question addressed in this chapter concerns the *primary* motivations driving prosocial behavior when it first emerges in toddlerhood. In particular, we seek to differentiate between two primary motivations for helping. One possibility is that toddlers' prosocial behavior is predominantly driven by a concern for the needs of others; in the boss example above toddlers helping would be predominantly motivated by the boss' need for help. Another possibility is that toddlers are more strategic in their prosocial behavior. Rather than basing their helping behavior solely on the needs of others,

toddlers may consider the potential affiliative benefits to acting prosocially and weigh those benefits against the costs of prosocial behavior. If toddlers are more strategic, they may be helping in order to affiliate or ingratiate oneself with their boss. In the following set of experiments, we will pit these two motivations against one another to determine whether early prosocial behavior is motivated more by others' needs or by other strategic motivations. Given that the bulk of studies on prosocial behavior in the second year of life have focused on instrumental helping behavior, we examine motivations of early prosociality in the context of instrumental helping tasks.

Recent studies demonstrate that instrumental helping of both familiar and unfamiliar individuals emerges in the second year of life (Hepach, Haberl, Lambert, & Tomasello, 2017; Warneken & Tomasello, 2006) and becomes increasingly frequent with age (Warneken, 2013). There is also evidence that, to at least a certain degree, infants and toddlers may be sensitive to the needs of others: toddlers will help an experimenter pick up an object only if the experimenter demonstrates that they have a goal and want the object. Toddlers do not pick up objects in situations when experimenters show disinterest in an object (Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011; Warneken & Tomasello, 2006) or when the person who they could help has other objects they can use (Hepach, Kante, & Tomasello, 2017). In fact, even within the first year of life, before infants engage in active helping, infants appear to recognize when others have greater need; they expect people to help needy individuals (i.e., an agent who is blocked by a barrier to reach the object they need) over individuals not in need (i.e., an agent who is not blocked by a barrier; Köster, Ohmer, Nguyen, & Kärtner, 2016). Moreover, in a situation where children themselves can help, older children (3.5-year-olds) are more likely to help someone who demonstrates that they are needier (e.g. the object they need is far from reach) than someone who

is less needy (e.g. the object they need is close to them; Paulus, 2019). Three-year-old children also choose to fulfill an experimenter's long term need rather than just fulfilling immediate requests (e.g. instead of helping an experimenter obtain a requested broken cup, children will instead bring a cup that is not broken to help an experimenter fulfill her goal; Martin & Olson, 2013). These findings together suggest that infants and toddlers can detect need and may be able to use this information to motivate their helping behavior.

There are some findings, however, that leave open the question of how strongly toddlers incorporate the needs of others in their helping behavior. In the same study described above, although 3.5-year-old children were significantly more likely to help needy individuals, 18-month-old toddlers equally helped needy and non-needy individuals (Paulus, 2019). Additionally, in many helping studies where toddlers' helping behavior was examined in experimental conditions (where need was present), and control conditions (where no need was present) the conditions varied along several other dimensions, making it unclear which factor(s) drove differences in toddlers' helping rates. For instance, in control conditions in helping studies where an experimenter requests objects, the experimenter actively throws objects on the floor. Thus, not only does the experimenter demonstrate that he or she does not have a need, but the experimenter also demonstrates that they will actively reject objects and there is also no goal to complete (Warneken & Tomasello, 2006). Thus, toddlers may use other factors besides need when deciding who to help.

Critically, from a young age, children also appear to weigh the personal costs of helping others, against the benefits of helping others, in order to decide whether to help an individual or not. In a recent study, toddlers were randomly assigned to a high-cost or a low-cost helping situation: in order to help an experimenter complete her block tower, toddlers needed to carry

either a heavy (high-cost condition) or a light block (low-cost condition) across the room. Overall, toddlers were significantly less likely to help in the high- over low-cost condition suggesting that toddlers minimize costs in their helping behavior (Sommerville et al., 2018). In a subsequent experiment, toddlers were significantly more likely to help in high-cost situations when the person they could help shared their toy preferences than when they did not share their toy preferences. Perhaps toddlers helped people who shared their preferences over people who did not share their preferences because they wanted to affiliate with people who are similar to themselves. Helping tasks, like other situations are inherently social. In order to help someone, you must interact with them. Therefore, it is possible that just like other social situations, the rules of social interaction apply, and toddlers may be more likely to interact with people they want to interact with in the future. Other studies have also found that toddlers selectively help and interact with fair over unfair people (Surian & Franchin, 2017), people who have positive intensions over people who have negative intensions (Dunfield & Kuhlmeier, 2010), and people who are prosocial over people who are antisocial to others (Dahl, Schuck, & Campos, 2013; but only 26 month old toddlers were significantly more likely to help prosocial over antisocial others). In all of these studies it would be arguably better to interact with one person over another (e.g. it would be better to interact with someone who is a helpful person over someone who might harm you). Thus, there may be benefits for affiliating with one person over another person. Additionally, toddlers are more likely to help after interacting with people who are more similar to them or engage in synchronous activities: toddlers are more likely to help people who mimic them (Carpenter, Uebel, & Tomasello, 2013), engage in interpersonal motor synchrony (Cirelli, Einarson, & Trainor, 2014; Cirelli, Wan, & Trainor, 2016), and engage in reciprocal activities (Barragan & Dweck, 2014). These findings provide further evidence that toddlers' helping is

modified based on the recipient, and it may be more advantageous to help people who are similar or are willing to engage in cooperative actives with them. Thus, under similar conditions of need, rates of toddlers' helping behavior varied with the costs and affiliative benefits of helping behavior.

Although motivations for helping are not mutually exclusive, to date, there has not been much work looking at situations in which different motivations for helping compete. When given the opportunity to help one of two individuals, will toddlers help the individual with greater need, or we will they seek to maximize potential affiliative benefits? In the world we are constantly navigating situations in which we have to decide whether to prioritize our own needs and desires over those of another person. Thus, investigating how toddlers behave in situations that pit another person's need against the costs and benefits to the toddler, may give us a better sense of the functions and underlying motivations for early prosocial behavior.

In the current work we investigate whether toddlers use potential affiliative benefits and consider others' needs when deciding who to help. Specifically, we use resource-wealth as a marker of potential affiliative benefit for several reasons. Being rich in resources is a marker of social status (Smith & Galinsky, 2010; Van Vugt & Tybur, 2015) and there are clear benefits from affiliating with wealthy people (e.g. wealthy people have more resources to give). Third, wealth is an interesting test case to examine because in older children preferences and prosocial behaviors dissociate when recipients are wealthy versus poor. Specifically, past research has found that although children prefer and say they like wealthy people more than poor people (Horowitz, et al., 2014; Li, et al., 2014; Shutts et al., 2016), older children give more to poor over wealthy individuals (Li, Spitzer, & Olson, 2014; Paulus, 2014; Rizzo & Killen, 2016) perhaps because they are prioritizing the need of recipients when engaging in prosocial behaviors.

Additionally, recipient wealth serves as an abstract proxy to recipient need; people who are poor and have less wealth likely need more help and support than people who are already rich and have lots of wealth.

In these experiments, we ask whether toddlers will choose to help people based on need (e.g. help "poor" people) or whether toddlers will choose to help people based on potential affiliative benefits (e.g. help "rich" people because they are high status or may give more to the toddler in the future). If toddlers, like children, are motivated *more* by recipient need, they should help people with less wealth regardless of the costs or benefits to themselves. However, if toddlers are motivated *more* by potential affiliative benefits, they should help people with more wealth when it is equally costly to help more and less wealth people, but they should also monitor potential costs to themselves while helping. In Experiment 1 we found some evidence to suggest that toddlers use potential benefits over recipient need when deciding who to help. Therefore, in Experiment 2 and 3 we investigated whether toddlers also consider costs when deciding who to help.

3.2 EXPERIMENT 1

In Experiment 1 we tested whether toddlers would be more or less likely to help "rich" people who possessed more wealth/resources or "poor" people who possessed less wealth/resources. By definition, the poor person is needier overall, and when children learn about people with more versus less resources, 5-year-old children recognize differences in need and will give more to poor people (Li, et al., 2014; Paulus, 2014; Rizzo & Killen, 2016). If toddlers in the current study are like children and choose to help poor people, this would provide evidence that early helping is motivated by recipient need. However, if toddlers choose to help rich people, this would provide evidence that early helping is motivated more by potential

affiliative benefits. Critically, we manipulated recipient wealth separate from the helping situation. We did this to ensure that in the helping situation, the goals of both the rich and poor person were identical and that toddlers would be equally attentive to both the rich and poor people during the helping task. If toddlers vary their helping it is because they are using the prior information about recipient wealth when choosing who to help. Additionally, in this experiment, it was equally costly to help the rich experimenter who had more wealth and the poor experimenter who had less wealth.

3.2.1 *Method*

3.2.1.1 Participants

We tested a total of *N*=48 17-month-old toddlers (27 girls; mean age: 17 months and 18 days; range: 16 months and 25 days to 18 months and 11 days). Data was collected until 24 toddlers made a choice to help one of the actors by bringing them a block[2]. Two toddlers were not included in the final sample due to a procedural error. Of the final sample, 39 parents identified their toddlers as White and 9 parents identified their toddlers as Multiracial. Primary caregivers completed their bachelor's degree or higher (*n* = 45) or had some college (*n* = 3). All toddlers were full term and typically developing. Participants were recruited from a database of

[2]Rates of helping were similar to past studies in which toddlers had to make a forced choice helping decision (Buttelmann, Carpenter, & Tomasello, 2009). Like past work, we think many of the non-helpers choose not to help because they were shy and did not want to approach the actors (Beier, Terrizzi, Woodward, & Larson, 2017). Additionally, blind coders rated non-helpers as significantly shyer than helpers (See Appendix A).

families who volunteered to participate in research at a large research university in the Pacific Northwest.

3.2.1.1 Procedure

There were three components to the experiment: a warm-up, a wealth display, and a helping task.

3.2.1.1 Warm-Up

The warm-up was included to decrease stranger anxiety and increase the likelihood that toddlers would make a choice to help one of the actors during the helping task. This also allowed toddlers to gain some familiarity with the actors in a controlled environment so that each toddler would have identical exposure to both actors.

Toddlers were seated in their caregiver's lap across from two actors seated at a table. The actors were White female adults. During the warm-up, each actor took a turn giving the toddler a toy. After receiving the toy, the toddler had the opportunity to play with the toy for 10 seconds. After 10 seconds had passed, the actor requested the toy back. The actors alternated who gave the toddler the toy such that the toddler had the opportunity to interact with each actor three times. The primary experimenter, different from the two actors, ensured actors were equally matched on affect, speed and use of language, and time spent interacting with the toddler. This was confirmed through a post-hoc procedural checklist.

Actors were blind to the role they were playing up to the actual wealth display such that they did not know if they played the rich or poor role during the warm-up. The side of the table the actors were sitting on (right and left) as well as the order the actors interacted with the toddlers (first and second) was counterbalanced.

3.2.1.1 Wealth Display

The purpose of the wealth display was to allow toddlers the opportunity to learn that one actor had many goods (rich actor) whereas the other actor had few goods (poor actor). The two actors were matched along all other dimensions.

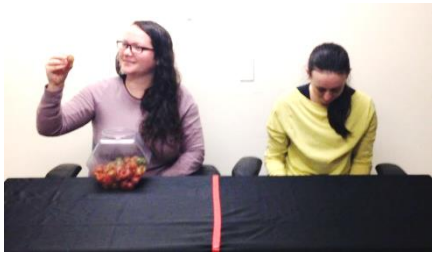
Toddlers were seated in their caregiver's lap and sat facing the table where the two actors were sitting. Toddlers sat approximately 64 centimeters away from the table, mid-way between the two actors, so that they could not reach the actors or their goods during the wealth display. Caregivers wore glasses that occluded their vision and were instructed to avoid interacting with the toddler during the procedure. The primary experimenter gave parents instructions throughout the experiment.

The actors either played the rich role where the actor possessed a bowl that was over half full or the poor role where the actor possessed a bowl that only contained three goods. During the wealth display, toddlers watched as the actors showed the toddlers their bowl of goods in alternating order. The first actor said "Hi," to the toddler. The actor then said "Look!" while pulling her bowl of goods out from underneath the table. Then the actor set the bowl on the table and said, "Look at all my cookies," while pulling out three cookies from her bowl. After the first actor showed her goods, the second actor repeated the procedure with her bowl of goods (i.e., each actor greeted the toddler and pulled 3 goods from the bowl). At the end of each demonstration, the toddlers had approximately 3 seconds to view both actors with their respective bowls in front of them to see that one actor clearly had more goods than the other actor (See Figure 3.1).

This procedure was repeated three times, once for a bowl of cookies, once for a bowl of balls, and once for a bowl of light-up rings. Therefore, toddlers saw that the rich actor always had more goods than the poor actor with three different sets of goods. The role the actors played

(rich vs. poor) was counterbalanced. Additionally, the actor order and actor side were counterbalanced. Across phases of the experiment the experimenter side and order were held constant: the actor who was sitting on the left and went first during the warm-up always sat on the left and went first during the wealth display and helping task.

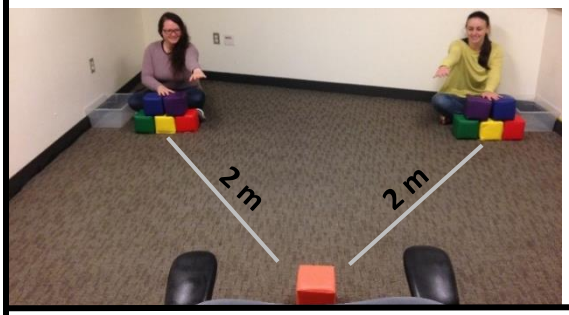
Wealth Manipulation (All 3 Experiments):



The "rich" actor who has bowls full of goods shows the toddler things in her bowl.

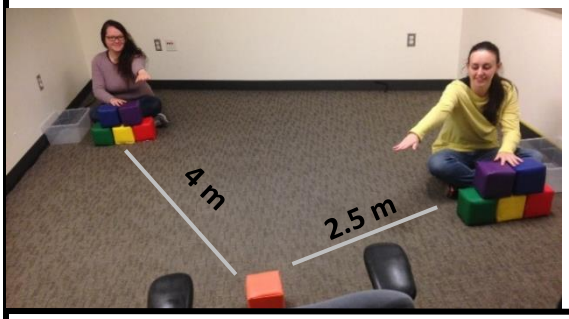
The "poor" actor who only has three goods shows the toddler things in her bowl.

Helping Opportunity Experiment 1:



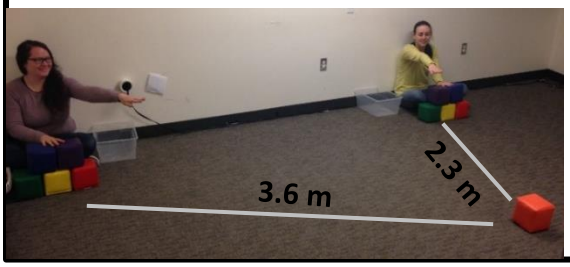
Experiment 1 helping opportunity. Toddlers could bring a block to either the "rich" or "poor" actor. The actors were equally far from the toddler

Helping Opportunity Experiment 2:



Experiment 2 helping opportunity. Toddlers could bring a block to either the "rich" or "poor" actor. The "rich" actor was further away from the toddler than the "poor" actor requiring more effort to help. In order to help the "rich" actor toddlers needed to pass by the "poor" actor.

Helping Opportunity Experiment 3:



Experiment 3 helping opportunity. Toddlers could bring a block to either the "rich" or "poor" actor. The "rich" actor was further away from the toddler than the "poor" actor requiring more effort to help. Here, toddlers did not need to pass the "poor" actor to help the "rich" actor.

Figure 3.1. Depiction of the Wealth Display and Helping Phase for all three Experiments in Chapter 3.

3.2.1.1 Helping Task

During the helping task, toddlers had the opportunity to help either the poor actor or the rich actor.

The helping task started with the toddler sitting on their caregiver's lap. The actors were seated on the floor equidistant apart, approximately 2 meters away from the caregiver and toddler. Each actor took turns building identical block towers with toy blocks (the prior goods were not in view during the helping task). After building most of the tower, each actor realized that she needed one more block in order to finish building her respective tower. A single block sat adjacent to the toddler. Each actor then looked at the block, pointed it out to the toddler, and reached out toward the block. The caregiver was then instructed to release their toddler on the floor directly behind the block. The toddler was prompted every 10 seconds by the primary experimenter to help by stating, "Who do you want to help, (toddler's name)? Do you want to help anyone?" for a total of 60 seconds or until the toddler brought the block over to one of the two actors.

3.2.1.1 Coding

The primary experimenter coded online whether or not the toddler helped by bringing one of the actors the block, and who the toddler chose to help (rich or poor actor). Another coder (who was blind to which actor was rich or poor) reliability coded 100% of participants from video. The blind coder agreed 100% of the time with the online coder with who the toddler chose to help.

3.2.2 *Results*

Preliminary analyses found that there were no significant effects of the order the actors (first vs. second), role the actor played (actor 1 rich vs. actor 1 poor), and side of the actor (left

vs. right) all *ps* > .15. Therefore, we collapsed across all of the counterbalanced variables for subsequent analysis.

The critical question of interest was which of the two actors the toddler chose to help, the rich or the poor actor. Toddlers were significantly more likely to help the rich actor than chance, $p = .007$, $g = .29$, sign test: 19 out of 24 helped the rich actor. See Figure 3.2.

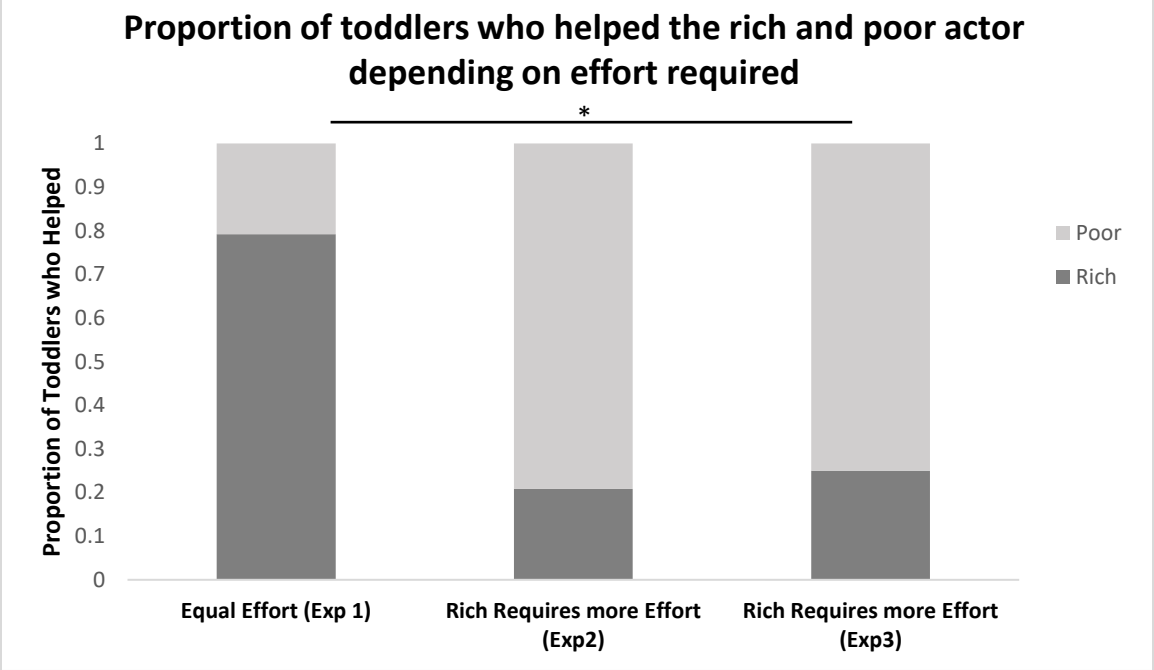


Figure 3.2. Proportion of toddlers who helped the 'rich' and 'poor' actor in Experiments 1, 2, and 3 in Chapter 3.

In Experiment 1, both the rich and poor actors were equidistant from the toddler. In Experiment 2 the rich actor was further away from the poor actor such that toddlers needed to pass the poor actor in order to help the rich actor and it also required more effort to help the rich actor. In Experiment 3 the rich actor was further away from the poor actor thus requiring more effort to help. However, toddlers did not need to pass the poor actor in order to help the rich actor.

3.2.3 *Discussion*

We found that toddlers were significantly more likely to help someone who is resource-rich over someone who is resource-poor. This provides some initial evidence that toddlers' primary motivation for helping is not based on recipient need alone. Instead, this finding is more

in line with the possibility that toddlers consider potential benefits when helping and use cost-benefit analysis over recipient need when deciding who to help. One reason it may be advantageous to affiliate with rich people is that it is possible that they have more resources to share and toddlers may recognize that rich people have more. This explanation is consistent with work that older children believe that rich people are more likely to share than poor people (Ahl & Dunham, 2017; Ahl, Duong, & Dunham, 2019). Another possibility is that toddlers may have wanted to affiliate with rich people because rich people are higher in status than poor people. Research with 17-month old toddlers has found that toddlers associate physical dominance with more resources (Enright, Gweon, & Sommerville, 2017) and research with children has found that children think that people with more resources or obtain more resources are "in charge" or the leader (Charafeddine et al., 2015; Gülgöz & Gelman, 2017). It is possible that toddlers may have consciously or unconsciously wanted to align themselves with people who have more power. Thus, there are multiple potential benefits for choosing to help rich over poor people and toddlers may be already weighing these affiliative benefits when deciding who to help.

Not only is this finding interesting for examining primary underlying motivations for prosocial behavior but is also informative for examining toddlers' early understanding and use of wealth information. During the helping task, both actors had identical numbers of blocks, and identical needs (i.e., they both needed a block to finish their tower); toddlers were therefore using previous wealth information when deciding who to help. This suggests that toddlers encode wealth information. Additionally, this is the first study to show that toddlers favor previously rich individuals over poor individuals when deciding who to help. Past work with children found preferences for rich over poor individuals (Horowitz, et al., 2014; Li, et al., 2014; Shutts et al., 2016), but a developmental shift in children's giving behavior. In particular, three-year-olds have

given at chance to rich versus poor people, but five-year-olds correct inequities and selectively give to those with less (Li, et al, 2014; Paulus, 2014; Rizzo & Killen, 2016). Perhaps 3-year-old children are giving equally because this is a time of developmental shift; early in development children may prosocially favor rich individuals like we found in our study, but with age may use recipient need when deciding who to give to. This is also the only study to investigate whether wealth information impacts helping behavior early in development.

3.3 EXPERIMENT 2

In Experiment 2 we further investigated the possibility that one of toddlers' primary motivations for helping is based on the costs and benefits of helping others. In Experiment 1 we found some evidence that toddlers consider affiliative benefits of helping (e.g. they helped the rich actor over the poor actor). To further test the hypothesis that toddlers consider costs and benefits, here we examine whether toddlers also consider costs when deciding who to help. It is possible that toddlers' decisions regarding who to help is uniquely influenced by the characteristics of the target recipient. For example, if toddlers selectively help because they merely form positive associations with one person over another (e.g. associate wealth with good) we might expect toddlers to help rich over poor individuals across a wide range of circumstances. Alternately, toddlers may weigh the benefits of helping particular target recipients against other factors, such as the physical costs involved in helping. If this is the case, toddlers' helping of the rich actor may be reduced or eliminated if doing so involves high physical costs.

To distinguish between these possibilities, we examined whether toddlers would go the extra mile and exert additional effort to help the rich over the poor actor. Previous research has found that toddlers will choose to minimize effort and are less likely to help when it requires

greater physical effort (Sommerville et al., 2018). For example, toddlers are significantly less likely to help someone when they need to bring a heavy block to help the recipient compared to when they need to bring a light block to help the recipient. Thus, the next question we asked was if toddlers would help the rich experimenter even when it necessitated greater physical effort and was therefore more costly. In the current study, effort was operationalized in terms of the distance needed to carry the block (i.e., a longer versus a shorter distance), since it requires more effort to bring someone a block who is across the room than to bring a block to someone who is closer to the toddler.

3.3.1 *Method*

3.3.1.1 Participants

A total of 63, 17-month-old toddlers (32 girls; mean age: 17 months and 14 days; range: 16 months and 21 days to 18 months and 26 days) participated in Experiment 2. As in Experiment 1, data was collected until 24 toddlers made a choice to help one of the actors by bringing them a block. Five toddlers were not included in the final sample due to procedural errors (n = 3) and fussiness (n = 2). Of the final sample, 37 parents identified their toddlers as White, 18 identified as Multiracial, 4 as Hispanic, 2 as Asian, and 2 parents did not report their child's race or ethnicity. Primary caregivers completed their bachelor's degree or higher (n = 53), had some college (n = 6), had a high school diploma (n = 2) or did not provide any information (n = 2). All toddlers were full term and typically developing. Participants were recruited from a database of families who volunteered to participate in research at a large research university in the Pacific Northwest.

3.3.1.1 Procedure

All toddlers took part in a warm-up, a wealth display and a helping task that were identical to those in Experiment 1, except for one key difference: during the helping task the poor actor was closer to the toddler when requesting the block (2.5 meters away) than the rich actor (4.0 meters away), resulting in greater physical effort to help the rich actor. This set-up also required the toddler to pass the poor actor in order to help the rich actor. See Figure 3.1 for a depiction of the room.

3.3.1.1 Coding

The primary experimenter coded live whether or not the toddler helped. If the toddler did help, the primary experimenter also coded whether the toddler helped the rich actor or the poor actor. Additionally, a reliability coder (blind to study hypotheses and the identity of the rich and poor actors) coded 100% of participants from video. Specifically, the reliability coder coded who each toddler helped by bringing the block over to them. The blind coder and primary experimenter agreed 100% of the time.

3.3.2 *Results*

Preliminary analyses found that there were no significant effects of the order the actors (first vs. second), role the actor played (actor 1 rich vs. actor 1 poor), and side of the actor (left vs. right) all *ps* > .54. Therefore, we collapsed across all of the counterbalanced variables for subsequent analysis.

The critical question of interest was which of the two actors the toddler chose to help (the rich/high effort or poor/low effort actor). Unlike Experiment 1, toddlers were significantly more likely to help the poor actor over the rich actor, $p = .007$, $g=.29$, sign test: 19 of 24 toddlers helped the poor actor (See Figure 3.2).

To see if toddlers' choice of who to help varied as a function of the effort required to help, we compared toddlers' responses to Experiment 1. Toddlers' tendency to help the rich actor differed significantly across experiments, $\chi 2\ (1) = 16.33$, $p < .001$, $\varphi = .82$ (See Figure 3.2) showing that for toddlers, the effort required to help played a critical role in who they choose to help.

3.3.3 *Discussion*

In Experiment 2, we found a complete reversal of toddlers' selective helping behavior. This experiment found that, first, toddlers do not always help the rich actor. Second, toddlers will minimize physical effort when helping. In fact, toddlers in the current study wanted to minimize physical effort so much so that it overpowered their baseline helping of the rich actor. When it was more physically effortful to help rich actors, toddlers instead choose to help poor actors who were easier to help. This provides further evidence that toddlers are not helping purely to benefit others and reduce others' needs; instead toddlers consider their own costs when deciding who to help. This is consistent with past work where toddlers considered physical effort when deciding who to help (Sommerville et al., 2018), even though effort was operationalized in a different way (distance in the current study versus weight in previous research). This adds additional evidence to the claim that physical costs decrease early helping behavior.

However, a different interpretation of our findings may exist. In this experiment, in order to help the rich actor, toddlers would need to physically pass by the poor actor in order to help the rich actor. This may have created a pragmatic oddity; as an adult, it would be strange to bypass one person who needs help in order to help another person. Therefore, it is possible that toddlers may help the rich actor under conditions of high effort, if doing so does not require them to pass the poor actor. We address this alternative possibility in Experiment 3.

3.4 EXPERIMENT 3

In Experiment 3, we changed the physical set up of the helping task, such that the rich actor was still further away from the toddler than the poor actor, but toddlers could choose to help by walking to their left or right instead of walking closer or further straight ahead (Experiment 2). Therefore, in Experiment 3 the rich actor still required greater effort to help than the poor actor but doing so did not require the infant to pass by the poor actor in order to help the rich actor (see Figure 3.1). If toddlers' helping behavior differed from Experiment 2, and toddlers were only helping the poor actor because they had to pass by them to get to the rich actor this would suggest that toddlers consider pragmatic factors when helping. However, if toddlers in Experiment 3 continue to help the poor actor who requires less effort to help, this would provide additional evidence that toddlers consider costs when helping.

3.4.1 *Method*

3.4.1.1 Participants

A total of 40 17-month-old toddlers (13 girls; mean age: 17 months and 4 days; range: 16 months and 20 days to 17 months and 25 days) participated in Experiment 3. Data was collected until 24 toddlers made a choice to help one of the actors by bringing them a block. Two toddlers were not included in the final sample due to parental interference (n=1) or because the toddler could not yet walk (n=1). Of the final sample, 33 parents identified their toddlers as White, 1 as Multiracial, 1 as Hispanic, 1 as Native American, and 2 parents identified their toddlers as "Other". Primary caregivers completed their bachelor's degree or higher (n = 34), had some college (n = 3), or had a high school diploma (n = 1). All toddlers were full term and typically developing. Participants were recruited from a database of families who volunteered to participate in research at a large research university in the Pacific Northwest.

3.4.1.1 Procedure

The procedure was identical to Experiments 1 and 2, except for the helping task. Like Experiment 2, the rich actor was further away from participants than the poor actor. However, the room was arranged such that toddlers did not need to pass the poor actor in order to help the rich actor. Instead they could choose who to help by walking to their left or to their right (See Figure 3.1). Similar to Experiment 2, the rich actor was 3.6 meters away from the toddler and the poor actor was 2.3 meters away from the toddler.

3.4.1.1 Coding

The primary experimenter coded live whether or not the toddler helped. If the toddler did help, the primary experimenter also coded whether the toddler helped the rich actor or the poor actor. Additionally, a reliability coder (blind to study hypotheses and the identity of the rich and poor actors) coded 100% of participants from video to determine who the toddler helped by bringing the block to one of the actors. The blind coder and primary experimenter agreed 100% of the time.

3.4.2 *Results*

Preliminary analyses found that there were no significant effects of the order the actors (first vs. second), role the actor played (actor 1 rich vs. actor 1 poor), and side of the actor (first vs. second) all *ps* > .308. Therefore, we collapsed across all of the counterbalanced variables for subsequent analysis.

The critical question of interest was which of the two actors the toddler chose to help (the rich/high effort or poor/low effort actor). Like Experiment 2, toddlers were significantly more likely to help the poor actor who required less effort to help over the rich actor, $p = .023$, $g=.25$, sign test: 18 of 24 toddlers helped the poor actor (See Figure 3.2).

To see if toddlers' choice of who to help varied as a function of the effort required to help, we compared toddlers' responses to Experiment 1. Toddlers' tendency to help the rich actor differed significantly across experiments, χ^2 (1) = 14.11, $p < .001$, $\varphi = .77$ (See Figure 3.2) showing that for toddlers, effort played a critical role in who they choose to help. Additionally, there were no significant differences between Experiments 2 and 3, χ^2 (1) = .12, $p = .731$, $\varphi = .07$.

3.5 General Discussion

In the current study we investigated whether toddlers use recipient need or consider costs and benefits when these two motivations for helping were in conflict. These experiments suggest that toddlers will consider their own costs and benefits over and above what another person needs. In Experiment 1 toddlers chose to help a rich actor over a poor actor suggesting that toddlers consider potential benefits when deciding who to help rather than helping based on recipient need alone. In Experiment 2 and 3 we found that toddlers also use costs when deciding who to help; specifically, toddlers minimized their own physical effort when helping. These effects fit with past research finding that toddlers are selective helpers and consider many factors when helping (Barragan & Dweck, 2014; Carpenter et al., 2013; Cirelli et al., 2014; Dahl et al., 2013; Dunfield & Kuhlmeier, 2010; Sommerville et al., 2018; Surian & Franchin, 2017). Toddlers' helping is not random: they systematically will choose to help one person over another person.

3.5.1 *Why do Toddlers Help Rich over Poor Individuals?*

When it required equal effort to help the rich or the poor actor, we found that 17-month-old toddlers overwhelmingly helped the rich actor. One possibility is that toddlers may help rich people because they believe they will directly benefit from helping them. Perhaps rich people

who have more resources may be more likely to reward toddlers for helping. Children have this same intuition and believe that resource-rich people are more likely to share than resource-poor people. (Ahl & Dunham, 2017; Ahl et al., 2019). Although possible, we believe that this explanation does not explain why toddlers choose to selectively help rich people for two reasons. First, even though 5-year-old children expect rich people to share, when asked who they themselves want to share with, children will correct inequities and share with poor people (Li et al., 2014; Paulus, 2014). Second, past work with 20-month-old toddlers has found that toddlers are *less* likely to help after being rewarded with a toy than they are to help when they are not materially rewarded (Warneken & Tomasello, 2008).

However, even though material benefits undermine helping, toddlers may be motivated by other (non-material) benefits. One early motivation for helping could be social; toddlers may be helping because they prefer and want to affiliate with people who have more. In fact, many studies with children have found that children say they like rich people over poor people (Shutts et al., 2016), prefer to play with rich people and befriend rich people (Li et al., 2014), and would rather be part of a rich person's group (Horwitz et al., 2014). Toddlers may also hold these preferences and want to affiliate with rich individuals over poor individuals. More generally, children and toddlers may want to affiliate with people who are high status. Past work has found that infants associate physical dominance with more resources (Enright et al., 2017) and children identify wealthy individuals as the person in charge (Charafeddine et al., 2015; Gülgöz & Gelman, 2017). Toddlers may also recognize that wealth is associated with status and therefore choose to affiliate with high-status people. Future research could manipulate status through another cue like physical dominance to determine whether toddlers are also more likely to help

high-status physically dominant individuals. This could help determine whether the effect we found is specific to wealth or is more generally related to status.

This work is also interesting given past work on sharing with wealthy versus poor individuals in childhood. Here we found that toddlers selectively helped rich over poor individuals. In studies with children, researchers have found developmental change with how children choose to prosocially act towards wealthy versus poor individuals. Specifically, children 5-years old and older are more likely to share with poor over rich people therefore correcting inequities (Li et al., 2014; Paulus, 2014). However, 3-year-old children give equally to rich and poor individuals (Paulus, 2014). Combined with the current work it could be that 3-year-old children are at a transition point. Developmentally, toddlers may first favor rich people in their prosocial behavior, but with age recognize inequities and switch to favor poor people. Alternatively, there may be important differences in helping versus sharing. All of the studies with older children have used sharing to index prosocial behavior and this may, more directly, correct inequities whereas helping may better index social affiliation. Future work could investigate whether older children will help rich or poor individuals more to determine if there is developmental change in helping wealthy individuals or whether there are important differences between different prosocial behaviors.

3.5.2 *Toddlers Consideration of Physical Effort in their Helping Behavior*

These studies also show that toddlers heavily weigh physical effort when deciding who to help. Here, even though toddlers helped rich over poor individuals when it was equally easy to help both people, physical effort outweighed toddlers' helping of the rich person. Past studies have manipulated physical effort by weighting items toddlers needed to carry in order to help (Sommerville et al., 2018), here we manipulated physical effort with distance required to walk in

order to help. This provides additional evidence that physical effort matters in early helping behavior through multiple manipulations of physical effort.

By pitting two things against one another (here we pitted wealth against physical effort), researchers can investigate toddlers' early cost-benefit decision making process. Researchers can examine what benefits will outweigh costs when helping and costs can be continuously manipulated (e.g. we can continuously manipulate how far away someone is or how heavy a block is that is needed to help). Additionally, researchers can use this method to study other factors toddlers may consider while helping.

3.5.3 *Conclusions*

Taken together, this set of experiments found that toddlers are more likely to help rich over poor individuals and seek to minimize physical effort when helping. These findings suggest that toddlers already notice differences in wealth from a young age and will favor rich over poor people when helping. However, physical effort overrode wealth information in toddlers' early helping behavior. These findings have important implications for early prosociality. First, it is clear from these studies that from a young age, helping behavior is not primarily driven by others' needs. That is not to say that toddlers do not use others needs when helping, but instead this is not the only information they use when deciding who to help. From this work and other studies, it is clear that helping behavior is motivated by costs and benefits. Thus, helping behavior may function like many other decision-making processes: from a young age we consider the potential costs and benefits and use this information to guide our actions.

Chapter 4. CHILDREN'S UNDERSTANDING AND USE OF SOCIAL STATUS

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4.1 ABSTRACT

Beginning early in life, children are exposed to people who differ in social status. The current research investigates whether 4- to 6-year-old children recognize different dimensions of status (i.e., wealth, physical dominance, decision-making power, and prestige), whether these status dimensions influence children's preferences for high- versus low-status people, and whether children differentially allocate resources toward high- versus low-status people. In Study 1, 4- and 5-year-olds identified higher (versus lower) status characters as in charge, indicating a recognition of status. In Study 2, 5-year-olds, but not 4-year-olds, were more likely to give resources to lower (versus higher) status people. Finally, in Study 3 we replicated our findings with 5- and 6-year-old children, showing that they preferred higher status individuals, but allocated more resources to lower status individuals. Taken together, across three pre-registered studies, we demonstrated that children identify and use social status across a variety of different dimensions.

4.1 Chapter 4 Introduction

Social status, or any hierarchy in which some people are positioned higher or lower than others based on a desirable dimension (Brown, 1991; Henrich & Gil-White, 2001; Van Vugt & Tybur, 2015), is ubiquitous across time and place. Throughout human societies, social status has played a key role in how we think about and interact with each other. Social status distinctions are likely visible in everyday life even to young children—for example children may see that some peers have more and better toys than others or that some children are bigger and stronger on the playground than others. To date, there are four social status dimensions that developmental psychologists have demonstrated that young children may have some understanding of: wealth (Charafeddine et al., 2015; Gülgöz & Gelman, 2017), physical dominance (Charafeddine et al., 2015; Lourenco et al., 2015), decision-making power (Brey & Shutts, 2015; Gülgöz & Gelman, 2017), and prestige (Chudek, Heller, Birch, & Henrich, 2012). However, the work across these dimensions has included children of differing ages, utilized quite different methodologies, and assessed different dependent variables, making it difficult to compare the findings across status dimensions or to determine how systematically (or not) children think about social status and use it to influence their attitudes and behavior. Therefore, the primary goal of the present work is to more systematically investigate whether young children recognize these four dimensions as indicators of status, whether they form attitudes toward people who vary on these dimensions, and whether they allocate resources differentially to people who vary on these dimensions using common methods, dependent variables and ages of participants.

We focus our work on 4-6-year olds as the majority of studies to date focus on this age group and are the youngest ages where children show an understanding of some dimensions of

status (e.g., prestige, Chudek, Heller, Birch, & Henrich, 2012), and because these children are able to answer direct questions about status at these ages. Our review (below and see Table 4.1 for quick summary) similarly focuses on this age group, allowing us to assess children's explicit attitudes and behaviors.

4.1.1 *Wealth*

The dimension in which the majority of research on children's understanding and use of social status has occurred in is the wealth dimension. This work has suggested that children recognize people with more or better resources as higher in status. For example, in one study, 3-5-year olds identified a person with more resources as the boss over a person with fewer resources (Charafeddine, Mercier, Clément, Kaufmann, Berchtold, Reboul, & Van der Henst, 2015) and in another study, 3-9-year-old children said that a person who gets more resources is the person in charge (Gülgöz & Gelman, 2017). Children also use wealth-based status distinctions as the basis of evaluations. Several studies, for example, find that 3-5-year-olds prefer wealthy children over poor children (Ahl & Dunham, 2017; Li, Spitzer, & Olson, 2014; Shutts, Brey, Dornbusch, Slywotzky, & Olson, 2016), think that others would prefer wealthy (to less wealthy) playmates (Mookherjee & Hogan, 1981), and would rather join a wealthy group over a poorer group (Horwitz, Shutts, & Olson, 2014). Finally, wealth distinctions are also linked to children's resource allocation. In one study, 4-5-year-olds chose to give a resource to an individual who had fewer resources than to someone who had more resources (Li et al., 2014). This finding was replicated in another study with 5-year-olds, but 3-year-olds gave equally to people with more versus fewer resources (Paulus, 2014). Taken together, the studies to date suggest that by age 4-5 years old, children see a wealthier person as more likely to be "in

charge", children prefer wealthier individuals, and children allocate more resources to poorer individuals.

4.1.2 *Physical Dominance*

Another dimension of social status that children recognize is physical dominance, or differences in strength and size. By 3-years-old, children say that they think bigger individuals will win competitions over smaller individuals (Lourenco, Bonny, & Schwartz, 2015) and that a more physically dominant individual who won a competition over another individual is "in charge" or "the boss" (Castelain, Bernard, Van der Henst, & Mercier, 2016; Charafeddine et al., 2015; Gülgöz & Gelman, 2017), indicating that children think of physical dominance as a form of social status and systematically utilize this dimension in inferring power relations. Unlike in the wealth dimension, only one study has investigated whether preschoolers use physical dominance information when forming preferences. In this study, 4- to 6-year-olds prefer and want to play with a person who wins fights over someone who does not win fights (Castelain et al., 2016). No literature to date has explored how children allocate resources to more or less physically dominant people. Thus, the existing literature provides fairly robust evidence that children use dominance to infer status (i.e., who is in charge), some evidence to suggest that they may prefer dominant individuals, and no evidence concerning how they would allocate resources.

4.1.3 *Decision-Making Power*

A third dimension of status researchers have explored in the developmental literature is decision-making power, or having the power to decide what others can or will do. There is mixed evidence about whether young children interpret decision-making power as a signal to social

status. Further, researchers have explored decision-making power in many ways, making it difficult to interpret different findings. For example, in one study, 3- and 4-year-olds say a person who gave instructions, and therefore was deciding what to do, is in charge over a person who received the instructions (Brey & Shutts, 2015). Another study, however, found that 3- to 6-year-olds could not identify who was in charge when one person, and not another, controlled access to a desired activity and got to decide what the other person got to do or what toys they could play with (Gülgöz & Gelman, 2016). Whether this difference in findings was due to differences in how decision-making was represented, or something else is unknown. Regarding preferences, two studies have found that 3- to 5-year-old children have no preference for (or against) people who have decision-making power (Bernard et al., 2016; Charafeddine et al., 2015). Finally, the findings regarding resource allocation are mixed with 3- to 4-year-olds giving significantly more resources to a person who had decision-making power over a person who did not have decision-making power, and 5-year-olds allocating equally to people high and low in decision-making power (Charafeddine et al., 2015). In sum, the literature on decision-making power does not show a clear pattern of results, with mixed evidence about whether children even notice this dimension of status or use it to inform their preferences or allocation.

4.1.4 *Prestige*

The final dimension of social status explored in the current work is prestige in which one gains social status through respect or admiration leading one to have many followers or admirers (Henrich & Gil-White, 2001). Only one study has investigated children's knowledge of prestige. In this study, 3- to 4- year-olds were more likely to pay attention to and imitate prestigious individuals over non-prestigious individuals, suggesting that they do in fact distinguish between people who have more or less prestige. However, 3- and 4-year-olds do not hold preferences for

prestigious versus non-prestigious individuals (Chudek, Heller, Birch, & Henrich, 2012). No work has examined whether children allocate resources as a function of prestige, and no work has directly tested whether young children expect prestigious individuals to be in charge.

Table 4.1. Summary of past work on preschoolers' understanding, preferences, and giving based on social status.

	Wealth	Physical Dominance	Decision Making Power	Prestige
Identification of Status	**Identify Status** (Charafeddine et al., 2015; Gülgöz & Gelman, 2017)	**Identify Status** (Castelain et al., 2015; Charafeddine et al., 2015; Gülgöz & Gelman, 2017; Lourenco et al., 2015	**Mixed Findings** (Brey & Shutts, 2015; Gülgöz & Gelman, 2017	**Never directly tested.**
Preference based on Status	**Prefer High-Status** (Ahl & Dunham, 2017; Li, et al., 2014; Shutts, et al., 2016)	**Prefer high-status** (Castelain et al., 2016)	**No preference** (Bernard et al., 2016; Charafeddine et al., 2015)	**No preference** (Henrich & Gil-White, 2001)
Giving based on Status	**5-year-olds give more to low-status, but 3-year-olds give more to high-status** (Li et al., 2014; Paulus, 2014)	**Unknown**	**3-4-year-olds give more to high-status, but 5-year-olds at chance** (Charafeddine et al., 2015)	**Unknown**

4.1.5 *The Current Studies*

In the current set of studies, we aim to systematically examine children's identification and use of social status in their judgements and decision-making. While preliminary work exists in some status dimensions, the goal here was to employ a similar method, participant pool, and dependent variables across social status dimensions, as well as to pre-register, replicate, synthesize, and expand work in this area. Across three studies we examined (1) Do children recognize status differentials within four dimensions of social status (wealth, physical dominance, decision-making power, and prestige)?, (2) Do children form preferences based on

each of these dimensions of social status?, and (3) Do children allocate resources based on each of these dimensions of social status?

We pre-registered our primary analyses within each study. Pre-registration is useful because it clarifies which analyses were decided a priori, reducing the number of researcher degrees of freedom (van't Veer & Giner-Sorolla, 2016) and easily distinguishes which analyses were planned versus posthoc (Moore, 2009; van't Veer & Giner-Sorolla, 2016). The pre-registration as well as data for this study is available on Open Science Framework (OSF): https://osf.io/6kypu/?view_only=03e4940649764b258810e79778aa201d. When relevant, we also describe posthoc analyses that led to follow-up studies.

4.1 Study 1

In Study 1, we asked whether children could reliably identify social status. The aim of this study was to replicate past work finding that young children recognize a variety of social status dimensions. Additionally, we also tested whether children systematically prefer high- or low-status individuals and whether this varies based on social status dimension (wealth, physical dominance, decision-making power, and prestige).

4.1.1 *Method*

4.1.1.1 Participants

Forty-eight 4-year-old and 5-year-old children (M = 59.54 months, SD = 7.04 months, 24 girls) participated in the study[3]. Sample size was determined in advance and was pre-registered (https://aspredicted.org/blind.php?x=hd2dr2). All participants in this study were recruited from a

[3] Additionally, we originally pre-registered that we would run n=24 3-year-olds. However, upon recruiting 3-year-olds we found that many of them could not complete the study. Of the first 13 3-year-olds we recruited, we had to drop 5 (38%), so we deemed the task too difficult for 3-year-olds and decided to stop recruitment of 3-year-olds.

university database of families who indicated that they were interested in child development research. There were an additional six participants who started the study and did not answer all of the questions. These children were excluded from analyses in accordance with our pre-registration.

4.1.1.1 Procedure

In this study and the two following studies, all children participated in a separate room from parents, so parents could not influence children's answers. Before starting the study, the experimenter explained to the child that she had a computer activity where she would read some stories, and then she would ask some questions about the stories. Children were also told there were no right or wrong answers, and that the experimenter was interested in their opinion. All children then verbally assented to say that it was okay to do the story activity and were informed that they could skip questions or stop anytime if they wanted to.

The experimenter then read 16 vignettes where one character was high-status, and one character was low-status. Corresponding pictures to go along with each vignette were shown on a computer. For example, in a physical dominance vignette, participants learned that one character was stronger than the other. Then, participants learned that both like to play tug of war and try to get the rope closest to them. Since one character is stronger, they always win and get the rope. Participants heard 4 vignettes on wealth, 4 on physical dominance, 4 on decision-making power, and 4 on prestige. All vignettes were pilot tested to ensure that children understood the stories. For a full list of all 16 vignettes and details on the pilot study, see Appendix B.

After participants heard each vignette, participants were asked, "Who is in charge?" to see if children inferred status from each vignette. Participants were also asked "Who do you like

best?" to assess whether differences in status led to differences in preference. The order of these questions was counterbalanced across participants. In addition, four different vignette orders were created—two were created using a random number generator and the remaining two counterbalance orders were created by reversing the random number generated orders. For all counterbalance orders, half of the time the high-status character was on the participant's right (and half of the time on the participant's left), half of the time the high-status character was mentioned first (and half of the time mentioned second), and half of the time a specific character was high-status (and half of the time that same character was low-status).

4.1.2 *Results*

4.1.2.1 Pre-registered Analyses

4.1.2.2 Do children identify social status?

To determine whether children identify social status, we added up the number of times in each dimension (out of 4) that children identified the high-status person as the person in charge. Thus, children received a score of 0 (if they never picked the high-status person as in charge) to a score of 4 (if they always picked the high-status person as in charge). We compared children's scores to chance responding ($M = 2$) with one-sample *t*-tests in accordance with our pre-registration.

Overall, children were significantly more likely to identify the high-status person as in charge in all four dimensions: wealth ($M = 3.02$, $SD = 1.19$), $t(47) = 5.93$, $p<.001$, $d = .86$, physical dominance ($M = 3.19$, $SD = 1.12$), $t(47) = 7.32$, $p<.001$, $d = 1.06$, decision-making power ($M = 3.13$, $SD = .98$), $t(47) = 7.94$, $p<.001$, $d = 1.15$, and prestige ($M = 2.98$, $SD = 1.21$), $t(47) = 5.60$, $p<.001$, $d = .81$. To determine whether it was easier for children to identify social

status in some dimensions over others, a repeated-measures ANOVA was run, finding no differences based on status dimension, $F(3, 141) = .84$, $p = .48$, $\eta^2 = .02$ (See Figure 4.1).

Next, we asked whether children were better at identifying status with age. Across all four dimensions, age was only correlated with identifying who was in charge in the wealth vignettes, $r(47) = .29$, $p = .048$. Age was not correlated with performance on physical dominance, $r(47) = .08$, $p = .57$, decision-making power, $r(47) = .15$, $p = .31$, and prestige vignettes, $r(47) = .10$, $p = .49$. Additionally, when the four status dimensions were pooled together, children did not identify who was in charge more (or less) as they got older, $r(47) = .19$, $p = .20$.

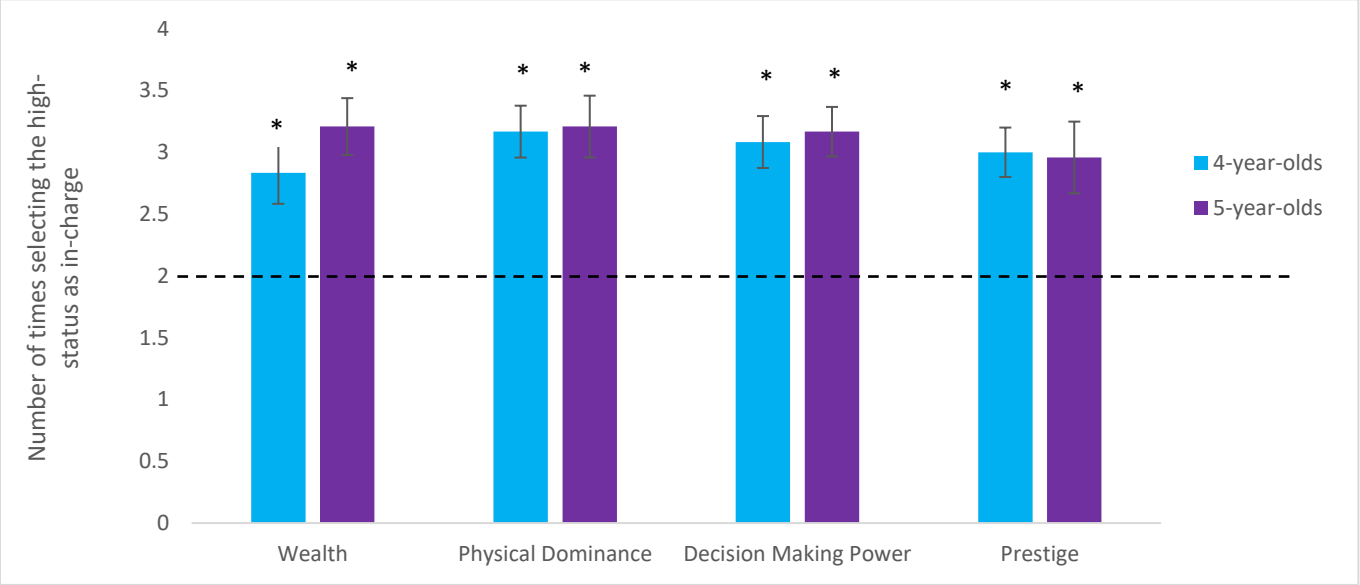

Figure 4.1. Average number of children who say the high-status person is in charge by social status dimension and age in Study 1 of Chapter 4.

Chance responding (2 of 4 choices) is indicated by dotted line, stars indicate significance from chance, and error bars represent standard error of the mean.

4.1.2.1 Do Children have preferences based on status?

To determine whether children have preferences for people based on status, a similar analytic approach was taken. First, in each dimension, we counted the number of times children

said they liked the high-status person best. This resulted in scores ranging from 0 (never preferring the high-status person) to 4 (always preferring the high-status person) for each dimension, which could be compared to chance (2) via a one-sample t-test. Overall, children did not differ from chance for each of the four dimensions: wealth (M = 2.35, SD = 1.36), $t(47)$ = 1.80, p = .078, d =.26, physical dominance (M = 2.23, SD = 1.43) $t(47)$ = 1.11, p = .27, d = .16, decision-making power (M = 2.13, SD = 1.25), $t(47)$ = .69, p = .49, d = .10, and prestige (M = 2.23, SD = 1.31), $t(47)$ = 1.21, p = .23, d = .18. Children did not hold different preferences based on the social status dimension, $F(3,141)$ = .70, p = .55, η^2 = .02 (See Figure 4.2).

Investigating whether age influenced children's preferences for high- and low-status individuals, we found that across all four dimensions of status, age was not significantly related to preferences: wealth, $r(47)$= .01, p=.94, physical dominance, $r(47)$ = -.07, p = .62, decision-making power, $r(47)$ = .04, p = .81, and prestige, $r(47)$ = -.002, p = .99. Additionally, when pooling all four status dimensions together, age was not related to liking based on status, $r(47)$ = -.01, p = .94.

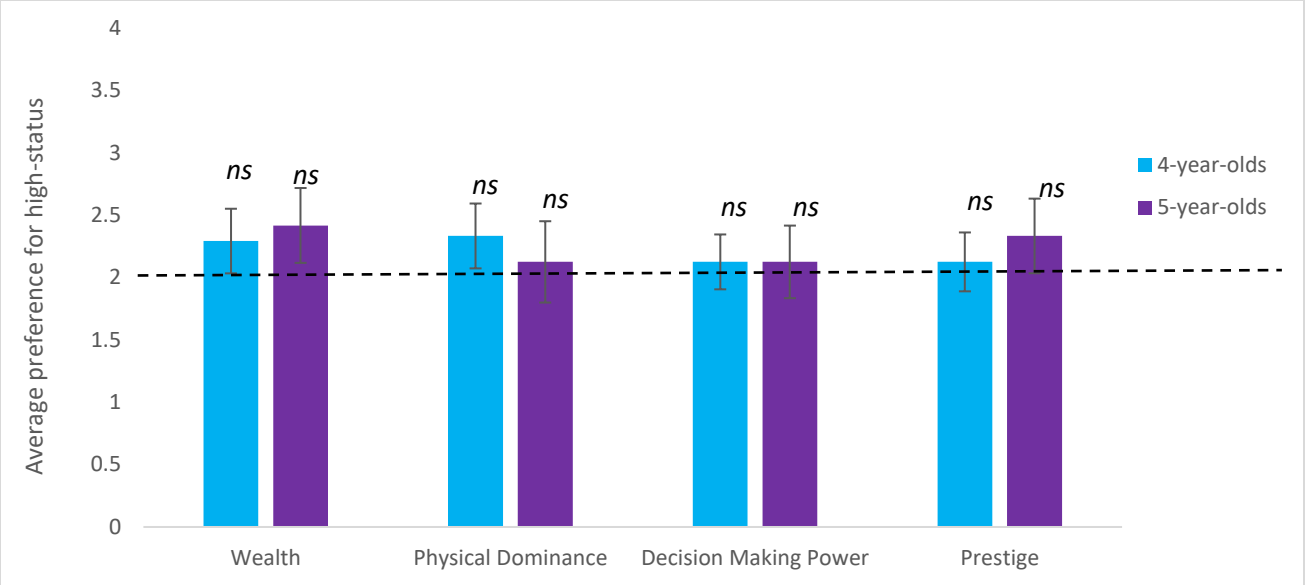

Figure 4.2. Average number of children who prefer the high-status person by social status dimension and age in Study 1 of Chapter 4.

Chance responding (2 of 4 choices) is indicated by dotted line and error bars represent standard error of the mean.

4.1.2.1 Is identifying social status related to liking based on social status?

Lastly, we pre-registered analyses to determine whether identifying who is in charge is related to who children prefer. Across all four dimensions, being able to identify who is in charge was not significantly related to liking of high-status individuals: wealth $r(47) = -.24$, $p = .10$, physical dominance, $r(47) = -.03$, $p = .85$, decision-making power, $r(47) = -.12$, $p = .43$, and prestige, $r(47) = -.16$, $p = .28$. Overall, pooling all four dimensions together, identifying status and liking based on status were unrelated, $r(47) = -.12$, $p = .43$.

4.1.2.1 Additional Analyses

In addition to our pre-registered analyses, we also pooled our main DVs across all four dimensions to find a composite score for total identification of the high-status individuals as well as the total preference for high-status individuals since there were no significant differences

across dimensions for both the identification and preference measures. Not surprisingly, since children were able to identify high-status individuals in all four dimensions, children significantly identified who was in charge when the four dimensions were combined (M = 12.31, SD = 3.77), $t(47) = 7.92$, $p<.001$, d = 1.14. Additionally, when pooled together across the four dimensions, children did not have a significant preference for high-status or low-status individuals (M = 8.94, SD = 4.64), $t(47) = 1.40$, $p = .17$, $d = .20$.

4.1.2.1 Counterbalance Effects

Further examination of the data suggested that the order of the questions influenced children's answers. On the preference question, counterbalance order significantly influenced whether children said they preferred the high- versus low-status character overall, $F(1,46) = 5.71$, $p = .021$, $\eta^2 = .11$ (See Figure 4.3). Children who were asked who they liked best first significantly preferred the high-status character to chance (M = 10.40, SD = 4.55), $t(24) = 2.63$, $p = .015$, $d = .53$. However, children who were asked who was in charge first were at chance for who they preferred (M = 7.35, SD = 4.27), $t(22) = .73$, $p = .47$, $d = .15$. (The same pattern emerges if we analyze each dimension separately, and these analyses are included in the appendix). Because this was a post hoc analysis, we sought to follow it up by replicating preferences based on status (in the absence of "who is in charge?" questions) in Study 3.

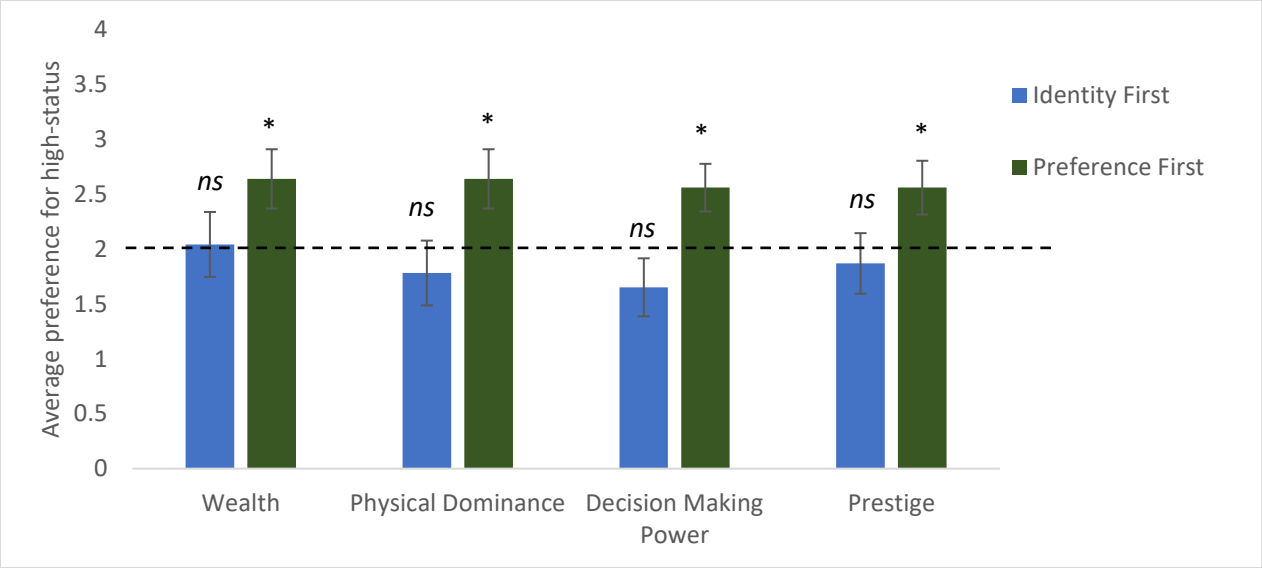

Figure 4.3. Average number of times children say they prefer the high-status person broken up by counterbalance order (asked the identity question first or the preference question first) and social status dimension in Study 1 of Chapter 4.

Chance is indicated by dotted line (2 of 4 choices), stars indicate significance from chance, and error bars represent standard error.

There was no significant order effect for identifying high-status individuals, $F(1,46) = 3.20$ $p = .080$, $\eta^2 = .07$. Both children who were first asked who was in charge ($M = 13.30$, $SD = 2.65$), $t(22) = 9.59$, $p<.001$, $d = 2.00$, and children who were first asked who they liked best ($M = 11.40$, $SD = 4.43$), $t(24) = 3.84$, $p = .001$, $d = .77$, identified the high-status person as in charge (See Figure 4.4).

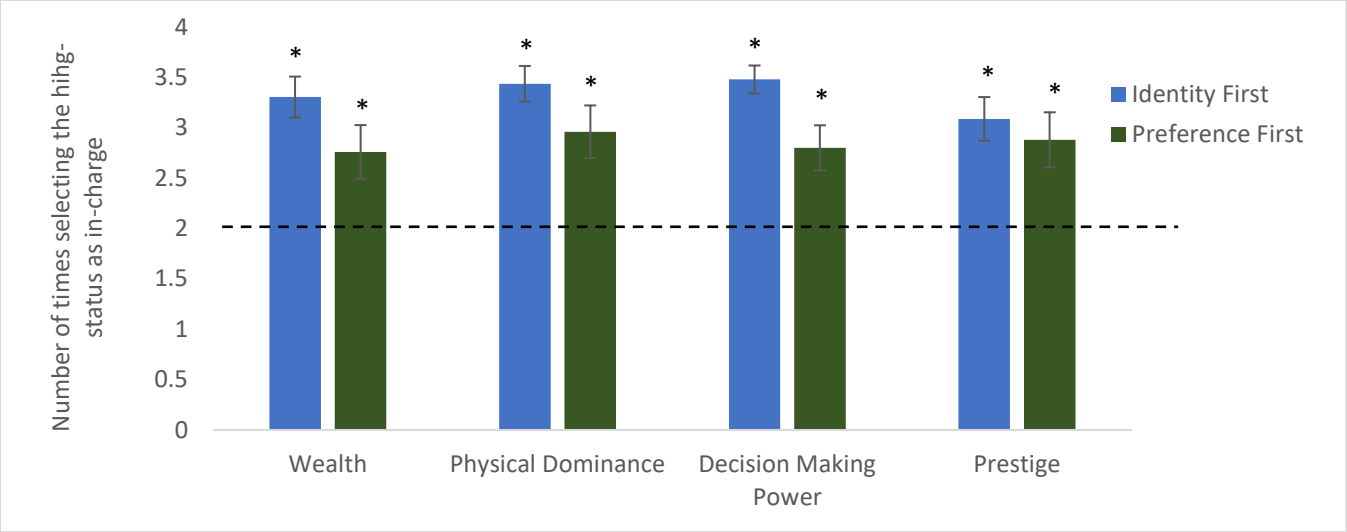

Figure 4.4. Average number of times children identify the high-status person as in charge broken up by counterbalance order (asked the identity question first or the preference question first) and social status dimension in Study 1 of Chapter 4.

Chance is indicated by dotted line (2 of 4 choices), stars indicate significance from chance, and error bars represent standard error.

4.1.3 *Discussion*

Across all four status dimensions, we found that children identified the high-status character as in charge. Age was largely unrelated to identifying who was in charge suggesting that by four years of age, children already recognize the relationship between wealth, physical dominance, decision-making power, and prestige as it relates to status. These findings replicate some existing work in the dimensions of wealth (Charafeddine et al., 2015; Gülgöz and Gelman, 2017), physical dominance (Castelain, et al., 2016; Charafeddine et al., 2015; Gülgöz & Gelman, 2017), decision-making power (Brey & Shutts, 2015), and prestige (Chudek et al., 2012). Our findings suggest that 4- and 5-year-old children found it equally easy to deduce status in our four different status dimensions, and this is the first study testing children's identification of status in these four dimensions utilizing the same basic methods.

Interestingly, we had mixed support for a relationship between status and preferences. That is, as a group, in each of the four dimensions, children did not systematically prefer higher status individuals (nor did they systematically prefer lower status individuals). However, we did find a significant preference for high-status people when this was the first question children were asked. A preference for high-status individuals is consistent with past work finding that children prefer wealthy over poor individuals (Ahl & Dunham, 2017; Horwitz et al, 2014; Li et al., 2014; Paulus 2014; Shutts et al., 2016). Additionally, researchers have found that children prefer physically dominant individuals over their subordinates (Castelain, et al., 2016).

However, for children who were asked who was in charge and *then* asked who they liked best, there was no systematic preference for high- or low-status individuals. Why? One possibility is that priming children to first explicitly identify social status could stop children from expressing a preference. For example, children may be taught or feel that they should not like someone based on status, and after having their attention drawn to status, they may now choose not to prefer the high-status person. Another possibility is that simply being asked multiple questions made children more confused (though note, the reversal of question order did not have this effect on the identifying status question). One finding from the literature is relevant here. Chudek et. al (2012) showed children a prestigious person and a non-prestigious person and then asked a battery of questions before asking who children liked best. In this format they also found that children showed no significant preferences for the more prestigious individual. Thus, it may be the case that when a preference question is asked later in a set of questions, the effect goes away, perhaps suggesting that the preference effect is smaller or more malleable than children's ability to identify high- and low-status individuals. We return to this issue in Study 3.

4.1 STUDY 2

While Study 1 focused on identifying status and preferences based on status, here we examine whether children differentially distribute a resource to high- or low-status individuals across the four status dimensions. Resource allocation is an important dependent measure because it presents an opportunity for children to systematically reinforce status hierarchies (by giving to the high-status person) or reduce inequities (by giving to the low-status person). Many studies have found that children give resources to the same people that they prefer (Dunham, Baron, & Carey, 2011; Paulus, 2016; Moore, 2009; Renno & Shutts, 2015). Since past work and one counterbalance order of Study 1 has found evidence that children prefer high-status individuals (Ahl & Dunham, 2017; Castelain, et al., 2016; Li et al. 2014; Shutts et al., 2016), a clear prediction is that children might reinforce social status hierarchies and give to the high-status person. However, past work has occasionally shown that children will rectify inequities by giving more to low-status people in the wealth dimension (Li et al., 2014; Paulus, 2014). Therefore, the opposite prediction—that children will give more to low-status individuals—was also plausible, particularly in the wealth dimension.

4.1.1 *Method*

4.1.1.1 Participants

Fifty[4] 4-year-old and 5-year-old children (M = 59.42 months, SD = 7.35 months, 24 4-year-olds, 28 girls) participated in the study. Sample size and analyses were pre-registered (http://aspredicted.org/blind.php?x=kd2h49). There were an additional three participants who

[4] We pre-registered that we would run 48 participants. We accidently ran two extra participants (both 5-year-olds girls). All analyses were computed with all 50 participants and the first 48 participants. The results reported in the main manuscript include all 50 participants for maximum power. The pattern of results did not change with the first n=48 participants with the expectation of the non-significant effect of giving more to less prestigious individuals moving from not significant (n = 50 participants, p = .056) to significant (first n = 48 participants, p = .039).

started the study and did not answer all of the questions. These children were excluded from analyses in accordance with our pre-registration.

4.1.1.1 Procedure

Before starting the study, the experimenter explained to the child that she had a computer activity where she would read some stories, and then the participant got to choose who to give an eraser to. The experimenter then read 16 vignettes with corresponding pictures on a laptop (the same vignettes as Study 1 with 4 vignettes on each status dimension). After each vignette, the experimenter placed a box under each character in each story. Children were asked "Who do you want to give the eraser to?", and children could then place the eraser in one of the character's boxes. The boxes were then placed behind the laptop with an understanding that the characters would get the erasers later, and new boxes were used with each vignette.

The counterbalance orders from Study 1 were used. This ensured that the order of the questions was counterbalanced, half of the time the high-status character was on the participant's right (and half of the time on the participant's left), half of the time the high-status character was mentioned first (and half of the time mentioned second), and half of the time a specific drawing of a character was high-status (and half of the time that same character was low-status).

4.1.2 *Results*

4.1.2.1 Pre-Registered Analyses

4.1.2.2 Do children systematically give to high- or low-status individuals?

To determine whether children systematically give to high- or low-status individuals, we added up the number of times in each dimension (out of 4) that children gave to the high-status person. Thus, children received a score of 0 to 4. We compared children's scores to chance responding (M=2) with one-sample t-tests consistent with our pre-registration.

Children distributed resources to high- and low-status individuals at chance for the wealth dimension (M = 1.82, SD = 1.40), $t(49) = .91$, $p = .37$, d =.13, the physical dominance dimension (M = 1.80, SD = 1.63), $t(49) = .87$, $p = .40$, $d = .12$, and the prestige dimension (M = 1.60, SD = 1.44), $t(49) = 1.96$, $p = .056$, $d = .28$. However, children gave significantly fewer resources to high-status individuals in the decision-making dimension (M = 1.64, SD = 1.21), $t(49) = 2.11$, $p = .040$, $d = .30$. To assess whether children gave differently depending on the status dimension, a repeated-measures ANOVA across dimensions (wealth, physical dominance, decision-making power, and prestige) was conducted, finding no differences across status dimension, $F(3, 147) = .81$, $p = .49$, $\eta^2 = .02$.

4.1.2.1 Additional Analyses

4.1.2.2 Are there differences in distributing to high- or low-status individuals on the basis of age?

A correlation between age in months and total distribution of resources to high-status individuals (the total across all four dimensions) indicated that age was significantly related to children's resource decisions, $r(49) = -.36$, $p = .010$. Specifically, older children were significantly less likely to give to high-status individuals across the four dimensions. To further explore this age relation, we broke participants up by age group (4- and 5-year-olds) and ran a one-way t-test comparing children's total distribution of resources to high-status individuals to chance (M = 8). Overall, 4-year-olds were giving to high- and low-status individuals at chance (M = 8.25, SD = 4.11), $t(23) = .30$, $p = .77$. However, 5-year-olds gave significantly fewer resources to high-status individuals (M = 5.58, SD = 5.16), $t(25) = 2.39$, $p = .025$ (See Figure 4.5).

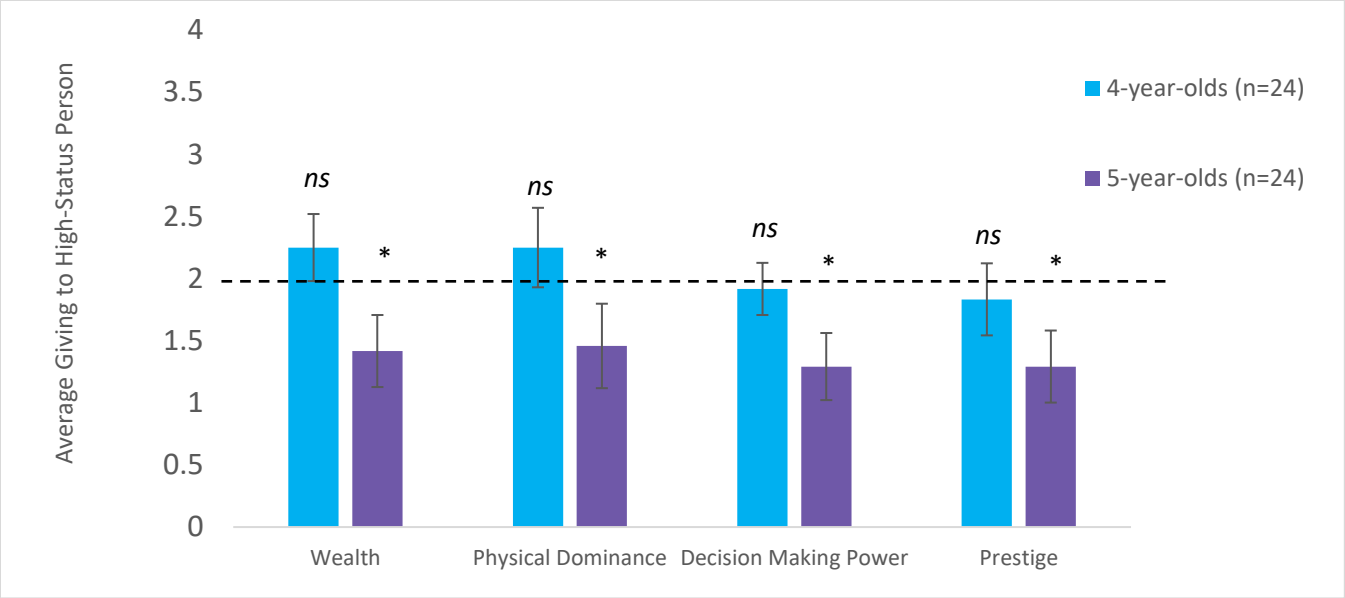

Figure 4.5. Average number of times children gave to the high-status person broken up by age and social status dimension in Study 2 of Chapter 4.

Chance is indicated by dotted line (2 of 4 choices), stars indicate significance from chance, and error bars represent standard error.

4.1.3 *Discussion*

Overall, children sometimes distributed more resources to low-status people over high-status people, but there was mixed evidence. In the pre-registered analyses, children gave significantly more to low-status people in the decision-making status dimension, but not in the wealth, physical dominance, or prestige dimensions. However, our exploratory analyses suggested there may be an underlying age effect. Age was correlated with allocation behavior such that older children allocated more resources to lower status people and younger children were at chance. Dividing the data into 4- versus 5-year-olds suggested that 5-year-olds showed a significant tendency to allocate resources to lower status children. This age-based giving finding is consistent with past work finding that 5-year-olds will give more resources to poor as opposed to wealthy individuals, whereas 3-year-olds did not preferentially give to poor versus wealthy

people (Paulus, 2014). Because the key finding—that 5-year-old children may allocate resources preferentially toward those with fewer resources—was a posthoc finding, in Study 3 we aimed to replicate this finding, along with the posthoc finding from Study 1 (that asking about preferences immediately after a vignette produces a preference for high-status people).

4.1 Study 3

Studies 1 and 2 provide preliminary evidence that social status may influence children's preferences and behavior. Specifically, children may prefer high-status individuals and, by 5 years of age, may give resources to low-status individuals. However, each of these effects was observed in posthoc analyses. To confirm (or not) these findings, we randomly assigned children to a preference condition where they are asked who they like best or to a distribution condition where they are asked to give a resource to a high- or low-status individual. We chose a between-subjects design to ensure that children's answers to who they liked best would not influence who they gave to and vice versa. Further, because of the suggested age effect in Study 2 that found that systematic allocation of resources may not occur until age 5, in this study we recruited 5- and 6-year-old children.

4.1.1 *Method*

4.1.1.1 Participants

Ninety-Six 5-year-old and 6-year-old children (M = 71.30 months, SD = 7.44 months, 48 5-year-olds, 41 girls) participated in the study, with 24 children of each age (5 vs. 6 years) assigned to each condition (preference vs. allocation). In addition to running children in the lab (n=67), we also recruited children to participate from area schools (n=29). Sample size and analyses were pre-registered (http://aspredicted.org/blind.php?x=66c5ye). There were an

additional three participants who started the study and did not answer all of the questions. These children were excluded from analyses in accordance with our pre-registration.

4.1.1.1 Procedure

Children were randomly assigned to either the preference condition or the resource condition. All children heard the same vignettes from Study 1 and 2, but in the preference condition they were asked who they liked best and in the resource task they were asked to give an eraser to one of the characters in the vignettes.

4.1.2 *Results*

4.1.2.1 Pre-Registered Analyses

4.1.2.2 Do 5- and 6-year-olds systematically prefer high-status people?

To determine whether children preferred high- or low-status people, we added up the number of times in each dimension (out of 4) that children said they liked the high-status person best. Thus, children received a score from 0 to 4. We compared children's scores to chance responding ($M = 2$) with one-sample *t*-tests consistent with our pre-registration.

Children preferred high-status individuals significantly above chance in the wealth dimension ($M = 2.93$, $SD = 1.16$), $t(47) = 5.62$, $p<.001$, $d = .81$, physical dominance dimension ($M = 2.69$, $SD = 1.19$), $t(47) = 4.01$, $p<.001$, $d = .37$, decision-making dimension ($M = 2.50$, $SD = 1.15$), $t(47) = 3.02$, $p = .004$, $d = .44$, and prestige dimension ($M = 2.65$, $SD = 1.10$), $t(47) = 4.06$, $p<.001$, $d = .59$. A repeated-measures ANOVA across dimensions (wealth, physical dominance, decision-making power, and prestige) indicated no differences across status dimensions, $F(3, 141) = 1.90$, $p = .13$, $\eta^2 = .04$.

To determine whether children preferred the high- or low-status individuals overall, we added up the total number of times across dimensions (out of 16) that children liked the high-

status individual best. Thus, children received a score from 0 to 16. We compared children's scores to chance responding (M = 8) with a one-sample t-test consistent with our pre-registration. Overall, children preferred the high-status individual significantly above chance (M = 10.77, SD = 3.33), $t(47) = 5.77$, $p<.001$, $d = .83$.

4.1.2.1 Do 5- and 6-year-olds systematically correct inequities and give to low-status people?

To determine whether children systematically gave to high- or low-status people, we added up the number of times in each dimension (out of 4) children gave to the high-status individual. Thus, children received a score from 0 to 4. We compared children's scores to chance responding (M = 2) with one-sample t-tests consistent with our pre-registration.

Children systematically gave to low-status individuals which was significantly different from chance in the wealth dimension (M = 1.13, SD = 1.47), $t(47) = 4.13$, $p<.001$, $d = .60$, physical dominance dimension (M = 1.10, SD = 1.29), $t(47) = 4.80$, $p<.001$, $d = .69$, decision-making dimension (M = 1.13, SD = 1.39), $t(47) = 4.35$, $p<.001$, $d = .63$, and prestige dimension (M = 1.35, SD = 1.38), $t(47) = 3.25$, $p = .002$, $d = .47$. A repeated-measures ANOVA across dimensions (wealth, physical dominance, decision-making power, and prestige) indicated no differences across status dimension, $F(3, 141) = 1.22$, $p = .31$, $\eta^2 = .025$.

To determine whether children systematically gave to the high- or low-status individuals overall, we added up the number of times across dimensions (out of 16) children gave to the high-status individual. Thus, children received a score from 0 to 16. We compared children's scores to chance responding (M = 8) with a one-sample t-test consistent with our pre-registration. Overall, children systematically gave to low-status individuals (M = 4.71, SD = 4.90), $t(47) = 4.66$, $p<.001$, $d = .67$. (See Figure 4.6 for a summary of Study 3 results).

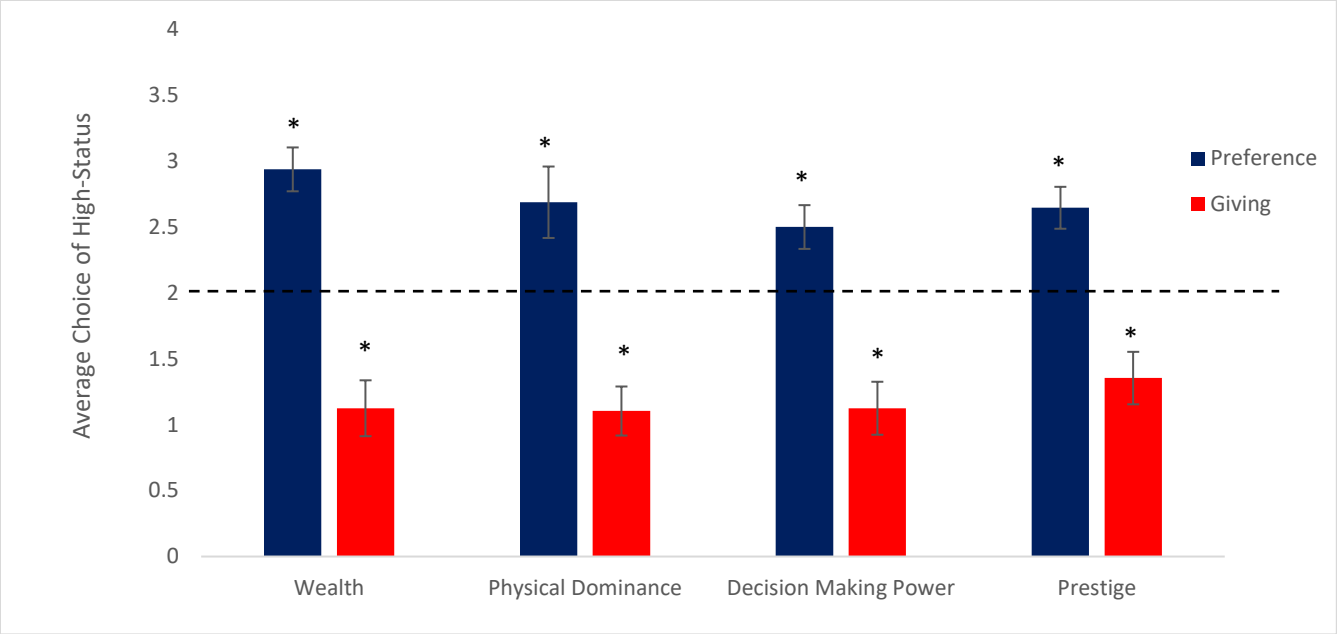

Figure 4.6. Average number of times children said they liked the high-status person (preference) and choose to give to the high-status person (giving) in Study 3 of Chapter 4.

Chance is indicated by dotted line (2 of 4 choices), stars indicate significance from chance, and error bars represent standard error.

4.1.2.1 Does age influence children's preferences and giving based on status?

A correlation between age in months and total preference for high-status individuals indicated that age was not related to children's preferences $r(47) = -.08$, $p = .59$. When we separated participants by age, both 5- ($M = 10.96$, $SD = 3.03$), $t(23) = 4.79$, $p<.001$, $d = .98$, and 6-year-olds significantly preferred high-status individuals above chance ($M = 10.58$, $SD = 3.66$), $t(23) = 3.46$, $p = .002$, $d = .71$.

A correlation between age in months and total distribution of resources to high-status individuals indicated that age was significantly related to children's resource decisions, $r(47) = -.35$, $p=.015$. Specifically, older children were less likely to give to high-status individuals across the four dimensions. Overall, 5-year-olds did not differentially give to high- versus low-status individuals ($M = 6.08$, $SD = 5.47$), $t(23) = 1.72$, $p = .099$, $d = .35$. However, 6-year-olds were

less likely than chance to give resources to high-status individuals (M = 3.33, SD = 3.90), $t(23)$ = 5.87, $p<.001$, d = 1.20.

4.1.3 *Discussion*

In Study 3, children preferred high-status individuals yet allocated more resources to low-status individuals. These preferences and giving behaviors did not differ by status dimensions; across wealth, physical dominance, decision-making power, and prestige, children preferred the high-status character while giving more to the low-status character. As discussed previously, this pattern of differential preference and allocation is consistent with past work in the wealth dimension where children prefer the wealthy but will give more to poor individuals (Li et al., 2014; Paulus, 2014). This is the first study to demonstrate this pattern across different dimensions of social status.

4.1 General Discussion

Across three studies, these results suggest that by 4 years-of-age, children identify who is and is not in charge demonstrating that they differentiate people based on social status. By 4-5 years of age, children also developed preferences based on status, preferring high-status over low-status people. Finally, by 5-6 years of age, children used social status information to inform their allocation behavior, choosing to allocate resources to low-status people rather than high-status people.

4.1.1 *Social Status Dimension Differences*

Overall, no differences were found in children's identification, preferences, and giving behavior across the four social status dimensions presented to children. This similar treatment is

surprising given the differential relevance of particular dependent variables to particular dimension. For example, resource allocation is directly relevant to some dimensions (e.g., wealth) but not necessarily others (e.g., prestige). That is, allocating a resource to someone who has few resources is a more obviously relevant action than allocating a resource to someone who is more popular. Similarly, one might assume that children would like prestigious individuals (i.e., they are by definition popular), but it less clear why children might prefer a physically dominant person or a person who has decision-making power to their lower status peers. In fact, an adult might view the characters who are physically dominant as bullies or those with decision-making power in our stories as bossy or controlling. For these reasons, it is especially striking that children did not show any differences in their treatment of social status across these status dimensions.

Why might children treat these diverse status dimensions similarly? One possibility is that children have a superordinate category or sense of social status as a larger construct. Perhaps when children identify that construct as relevant, they treat all examples of social status similarly. Therefore, the consistency across dimensions reflects the fact that children at these ages may think, as researchers do, that there is an overarching construct of social status and that is the construct they are responding to. Consistent with this idea, other work has suggested that children link different status dimensions. For example, 3-5-year-old children expect individuals who are physically dominant to have more resources than individuals who are not physically dominant (Charafeddine et al., 2015). This finding could indicate that children see each of these status dimensions as related and perhaps indicative of a broader underlying status dimension.

However, it is also possible that it may be coincidental that children treated all dimensions similarly in this work. Perhaps they can and do make important distinctions, but

these particular, fairly simple tasks did not tap into their differential reasoning about these dimensions or were not sensitive enough to detect differences. Research with adults suggests that adults differentiate between physical dominance and prestige and treat these forms of social status differently (Henrich & Gil-White, 2001). Specifically, this work argues that adults will preferentially imitate, approach, and stare at high-status prestigious individuals whereas this is not the case for high-status physically dominant individuals. In contrast, they give physically dominant individuals "furtive glances", do not choose to approach physically dominant individuals or imitate them when they are not in the physically dominant individual's pretense. Future work might benefit from testing theories that predict differences by selecting dependent variables specific to these theories (e.g., testing children's approach and imitation of prestigious and physically dominant people). For now, it remains an open question whether children will treat different dimensions of social status differently or whether they treat the four status dimensions the same.

4.1.2 *Why do children prefer high-status individuals but give more to low-status individuals?*

Another notable finding from these studies was that children prefer high-status individuals but also gave more to low-status individuals. In past research we have often seen children at this age give more resources to the same individuals that they tend to prefer (e.g., Dunham et. al, 2011; Paulus, 2016; Moore, 2009; Renno & Shutts, 2015). Why might we see this different pattern in the present work? One mechanism proposed by past work is affective tagging (Olson, Dunham, Dweck, Spelke, & Banaji, 2008), or the idea that people automatically and unconsciously evaluate people. This "tag" is then relied on for making judgments unless a person is encouraged to make a more conscious, deliberative decision. Evidence for affective tagging has come from studies of patients with difficulty forming explicit memories (Johnson, Kim, &

Risse, 1985) and those who have trouble overriding evaluative information (Tranel & Damasio, 1993). These studies have demonstrated that even in the absence of any explicit memory for having met a person, people evaluate those individuals based on unconscious or implicit evaluations they formed previously. Li and colleagues (2014) argued that a similar process may occur when children see people of high or low wealth—they may simply associate the person with greater wealth with more positivity (i.e., they may tag a person with a positive affective tag automatically because wealth is evaluated positively) and therefore when their preferences are assessed they report greater liking for those with greater wealth. Li and colleagues also found the present pattern wherein children allocated a resource to a lower wealth individual. They argued that the allocation decision drew on more deliberative processing. To test that possibility, children completed the allocation decision under cognitive load (via a memory task) and in this case, children instead allocated to the higher-wealth target. Li and colleagues argued that this change in behavior occurred because participants were not able to consciously remember which child had more resources, but they were able to rely on that affective tag that had occurred upon introduction to the targets. Thus, the deliberative decision to favor the lower status person was overridden by the automatic preference for the higher status person. A similar process could be occurring here wherein children rely on affective tags when asked about their preferences, but when asked to allocate, children perhaps draw on more explicit instructions about being fair. Similar findings have been observed in adults: Adults will say they will correct inequities in studies when they have time to think about status (Lamm & Schwinger, 1980), but when forced under a cognitive load or a time crunch, adults will perpetuate inequities and give more to high-status individuals (Van Berkel, Crandall, Eidelman, & Blanchar, 2015).

Affective tagging could explain why children prefer higher status targets, but why might children prefer to allocate resources to lower status targets, at least when they have unlimited cognitive resources to inform their decision? Adults actively teach children to share with people who have less and teaching this to children has been found to increase sharing in some children (Gelfand, Hartmann, Cromer, Smith, & Page, 1975). Perhaps children in our study and others (e.g., Charafeddine et al., 2016; Li et al., 2014; Paulus, 2014) see the lower status person as being disadvantaged, thereby warranting a resource to make things more equal. Anecdotally, some children spontaneously stated that they wanted to be fair when giving to the low-status individual or referenced correcting inequities. One child mentioned he wished the eraser was a house on one of the wealth vignettes, hoping to even out the unequal wealth distribution. Future research is needed to further test whether affective tagging, combined with explicit reasoning about fairness, might explain these results.

An alternative or additional explanation for the resource allocation results is empathy. Past work has found that young children and even infants care about others' feelings (Eisenberg, Spinrad, & Sadovsky, 2006; Roth-Hanania, Davidov, & Zahn-Waxler, 2011) and will try to comfort or alleviate others' distress (Vaish, Carpenter, & Tomasello, 2009; Zahn-Waxler, Radke-Yarrow, Wagner, & Chapman, 1992). Children may have believed the low-status individual was sad or upset at the difference in wealth or not getting attention in the prestige stories, and children may have been trying to alleviate this by giving more to the low-status individual. Anecdotally, children also mentioned they wanted to make children happy when giving the resources. Past work has suggested that with age, children develop a better understanding of others' emotions and are able to take others' perspectives (Borke, 1973; Ricard & Kamberk-Kilicci, 1995).

A final explanation for why children give more to low-status people with age could be due to reputational concerns. We know that children are concerned with their reputations by around 5 years of age and attend to the presence (or absence) of others (e.g., Silver & Shaw, 2018). In all of the studies, an adult experimenter was always present to run the study and record children's responses. Perhaps, socialization to share with the less fortunate and social norms may have made children feel compelled to give to the low-status individual since an adult experimenter was present. In everyday life, an adult is probably not watching who children share with throughout their day. Thus, it is possible that our results are driven by reputational concerns, and children may have always favored the high-status individual had an adult not been present, which would align closely with past studies finding that preferences typically align with who children choose to give to or favor.

4.1.3 *Limitations and Future Directions*

A difference between these studies and everyday life is how much attention was drawn to social status. Within our studies, we held all other factors constant, thereby drawing attention to targets' disparities in social status. In everyday life, children are likely considering many factors in combination with social status. For example, when choosing to give to or share with others, children could be considering whether the other person is their friend (Paulus, 2016; Moore, 2009), a member of their group (Fehr, Bernhard, Rockenbach, 2008; Yu, Zhu, & Leslie, 2016), and a prosocial person who could or has reciprocated (Olson & Spelke, 2008; Warneken & Tomasello, 2013), among many other factors. Since we stripped down the study to only investigate social status' effects on giving and preferences, we may have exacerbated the effects more than we would find in everyday life.

Alternatively, we may have underestimated the size of these effects because each manipulation was only a two-sentence story. Perhaps in real life when these differences occur the effects would be bigger. For example, a child might see a rich peer with many cool toys, clothes, and other resources every day at school. Further, these factors may compound in real life such that people who are wealthy or dominant might also get to make more decisions and have more people look up to them. As a result, children may see even more social status cues to draw upon. Because these lab effects could either over or underestimate the effects in an ecologically valid context, one must be careful in generalizing these findings. These findings should instead be taken as evidence that children *can* draw distinctions based on status and *can* use these distinctions to inform their attitudes and behaviors.

It is also important to consider the sample when drawing conclusions. Participants in the current sample were primarily white and high SES. It is unclear if these findings would generalize to all 4-6-year-olds. This concern is particularly important because children's own status could impact their understanding, preferences, and giving based on status.

There are many open questions regarding how children come to recognize social status and how it influences children's preferences and behavior. To date, there is little work investigating individual differences in how children respond to social status. Although as a group, children in this study preferred high-status individuals, not all children followed this pattern. Similarly, while as a group children gave to low-status individuals, there were some children who gave resources more often to high-status individuals. What might explain these differences? One explanation could be differences in culture or socialization. Differences could be due to differences in social norms surrounding status, differences in children's own social status, or differences in empathy. Future work could try to explain these individual differences.

Other future work could compare across cultures to see whether there are differences in children's status-based attitudes. If preferences for social status stem from affective tagging and automatic and unconscious processing, we would expect to find that children across all cultures would prefer high-status individuals. Alternatively, if our findings are due to parents teaching their children to give to low-status individuals, we might expect to find individual differences based on cross-cultural norms and preferences.

4.1.4 *Conclusions*

Understanding early recognition of social status and how it impacts children's preferences and giving behavior is important for determining whether, how, and why social hierarchies are reinforced or dismantled, how individuals who are high- and low- in status are treated, and for understanding the origins and development of intragroup relations. Our findings illustrated that by the early primary school years, young children recognize many forms of social status, prefer high-status individuals, and give resources to low-status individuals.

Chapter 5. DISCUSSION

5.1 SUMMARY OF FINDINGS

This dissertation establishes a more comprehensive understanding of infants' and children's early representations of status, early preferences based on status, and early giving based on status. Chapter 2 suggested that not only do toddlers recognize physical dominance, but toddlers also have a fairly sophisticated representation of status such that they expect physically dominant people to receive more resources. Further, I found that social status impacts toddlers' *own* behavior. Specifically, in Chapter 3 I found that toddlers were more likely to help resource-rich over resource-poor individuals perhaps suggesting that toddlers already have biases based on status and will act on these biases.

Additionally, this dissertation investigated whether there are developmental changes in how humans represent and use status information. We now know that children have a robust understanding of status differences such that children recognize multiple dimensions of social status (i.e. wealth, physical dominance, decision making power, and prestige). Going beyond understanding of status, I found that status impacts children's preferences such that children prefer high- over low-status people. No developmental changes were found based on recognition of status or preferences based on status. However, unlike toddlers, with age, children were more likely to give to low- over high-status people perhaps suggesting an important developmental change in early prosociality based on social status, a topic I return to later.

5.2 EARLY RECOGNITION OF SOCIAL STATUS

Since humans have a robust understanding of social status from a young age, this leaves open the question as to why this is the case. One potential reason why an understanding of social

status is robust early on could be because humans have an innate mechanism, or built in device, for representing social status differences. This mechanism may be shared with other animals: many other species recognize differences in physical dominance (Bond, Kamil, & Balda, 2004; Grosenick, Clement, & Fernald, 2007; Oliveira, McGregor, & Latruffe, 1998), and humans seem to represent physical dominance in a similar way by tracking who is dominant over who. Additionally, it would be evolutionarily adaptive to have an innate mechanism for representing status differences: it is advantageous to quickly and accurately represent who is physically dominant. Further evidence that humans may have an innate mechanism for representing status comes from work suggesting that other cultures and societies recognize social status differences. Indeed, anthropologists have argued that social status hierarchies are universal and recognized across cultures (Brown, 1991) and this and other's work has found that infants recognize status differences from a surprisingly young age where they likely have limited experience seeing status differences (Mascaro & Csibra, 2012; Pun et al, 2016; Thomsen et al, 2011). Thus, it is entirely possible that humans do indeed have an innate mechanism for representing social status information.

However, it is also possible that infants and children do not have an innate mechanism for representing social status hierarchies but instead construct knowledge through experience with social status differences they see in their day-to-day-lives. I believe that this explanation is more likely even though infants recognize status differences. Social status differences are ubiquitous: infants likely see that big siblings get the toys they want, parents make decisions for their children, and teachers are leaders. Not only do children see and experience these differences, but they also see the consequences of social status, namely perks like admiration and resources for high-status people. Additionally, humans are highly social, and a plethora of research has found

that infants and children have strong preferences to pay attention to people (Berk, 2004). Since young children likely pay attention to these differences and have direct experience observing wealth, physical dominance, decision making power, and prestige hierarchies might be responsible for infants' and children's robust recognition of social status differences in these studies. In my work I found individual differences in children's recognition of status. Some children identified who was "in charge" in all stories they heard whereas other children were at chance for identifying high status people. Perhaps children with more experience with status such as having older siblings and attending preschool were better at recognizing status than children who do not have siblings and do not attend preschool. To my knowledge, no studies have investigated whether or not experience or culture matters for representing status. However, studies in the United States (Gülgöz & Gelman, 2017; Lourenco et al., 2016), France (Charafeddine et al., 2015), and with indigenous Mayan children (Castelain et al., 2016) have found that children have representations of social status and identify who is the high-status person. If socialization or culture is what drives children's status recognition, children's experience should matter for their representation and understanding of status. Future work could test infants' and children's exposure to status and how this relates to their representations of status.

Regardless of whether or not there is an innate mechanism for representing status or if infants construct status knowledge from experience, I believe that social status plays an important role in human social cognition. Adults rapidly and automatically recognize social status differences (Oosterhof & Todorov, 2008) and researchers have identified key brain areas that respond to social status information (Pornpattananangkul, Zink, & Chiao, 2014). Thus,

status is quickly identified and could potentially influence social interactions even if infants, children, and adults are not consciously tracking social status differences.

5.3 Preferences based on social status

Across all four dimensions of social status tested, children preferred high- over low-status people. One possibility for why this is the case is because children may believe that they will gain concrete or other abstract affiliative benefits by choosing and aligning themselves with high-status individuals. There is some evidence suggesting that this may be the case; 4-10- year-old children believe that wealthy people are more likely to share than poor people (Ahl & Dunham, 2017; Ahl et al., 2019) and 3-4- year-old children will selectively learn from prestigious over non-prestigious individuals (Chudek, Heller, Birch, & Henrich, 2011) suggesting that children believe they can gain concreate benefits (resources) and abstract benefits (learning new skills) from high-status people. Future work could manipulate benefits associated with novel people to see whether benefits drive preferences, and if so, what benefits result in stronger preferences.

Beyond benefits, another possible reason why children preferred high- over low-status people could be through a process called affective tagging where positive and negative information is paired with specific people, events, or things. Researchers have found that adults prefer other people and objects associated with positivity over people and objects associated with negativity regardless of whether or not adults consciously remember the positive and negative associations (Duckworth, Bargh, Garcia, & Chaiken, 2002; Johnson, Kim, & Risse, 1985). A similar process may be occurring here where children notice lots of good stuff is associated with particular people (wealthy individuals have large quantities of nice resources, physically dominant individuals win games and achieve goals, decision makers get their way, and

prestigious individuals are associated with other people's acceptance). Because of these positive associations, children form preferences for high-status people (Li et al., 2014). If this were the case, children may not have preferences for high-status people per se, but instead may be simply learning associations between good things and high-status people. These associations, whether conscious or not, could explain why children choose high-status over low-status people for who they liked best.

Although not mutually exclusive, another mechanism for why children may prefer high-status people is because they may learn that others prefer and value high-status people which could also influence early, status-based preferences. Indeed, past work has found that children notice others' preferences and prefer people who are valued by others (Skinner, Metlzoff, & Olson, 2017), and high-status people are preferred and receive preferential treatment by adults (Kirby, 2006; Lott, 2012; Lott & Saxon, 2002). Even in the media children are likely exposed to praise of high-status people: physically dominant athletes are idealized in the media as are wealthy movie stars.

Potentially, all three of these explanations could contribute to children's preferences for high-status over low-status people or one explanation might primarily drive children's preferences. To evaluate which explanation is most likely, future work can investigate other situations in which children have preferences for one person over another. For example, to determine the effect of others' preferences on children's own preferences, researchers can compare situations in which children either learn that others favor low-status people or that others favor high-status people. If children always prefer who others like best, this would suggest that others' preferences may drive children's preferences.

5.4 Developmental change in prosociality based on a recipient's social status

Although I found that toddlers helped *high*-status people, 5- and 6-year-old children gave more erasers to *low*-status people. One possible reason for why toddlers' and children's prosociality differed could be due to an important developmental change in socialization between toddlers and children. Parents and teachers may be telling children to share with people who have less. Specifically, this developmental change seems to be occurring around 4-5 years of age as 4-year-old children gave at chance to high- and low-status people and 5-year-old children gave more to low-status people. In the United States, where these studies took place, children typically enter formal schooling in kindergarten when they are 5 years old. Thus, it is possible that experiences in a formal education setting could be driving this change. Future investigations could test whether socialization is responsible for this developmental change by comparing children of the same age who both have and have-not yet entered formal schooling. Examinations of parents' attitudes would also provide valuable insights towards understanding the role of socialization in children's sharing with high- versus low-status people.

Empathy could also explain age-related changes in prosociality based on status. As children get older, they develop more empathy for others (Hoffman, 1977), and may be more capable of understanding the perspectives of low-status people. In fact, researchers have found that children's recognition of others' emotional states increases between 3-6 years of age (Borke, 1973), perspective taking increases between 2-6-years of age (Mossler, Marvin, & Greenberg, 1976), and theory of mind abilities increase between 2-8 years of age (for a meta-analysis see Wellman, Cross, & Watson, 2001). Children with greater empathy and perspective-taking skills may recognize that low-status individuals have a greater need for resources, or the child may

remember a time when they were in need or low-status themselves. Eisenberg (1983) proposed that children's empathy for a person in need is positively related to whether or not children choose to help that person. In tests of this theory, meta-analyses have found that empathy was indeed positively related to prosocial behavior (Eisenberg & Fabes, 1990; Eisenberg & Miller, 1987) and studies with adults have found that more empathetic adults are more likely to give to poor, low-status people (Lee & Chang, 2007). However, in these studies, empathy was positively related to whether or not adults and children chose to engage in prosocial behavior, but not whether adults and children engaged in more prosocial behavior with one person over another. To specifically test whether empathy could explain these results, researchers could test whether children with more empathy are more likely to give more to low-status over high-status people. If empathy is related to children's selective giving, researchers could determine whether there is a causal relationship by designing an empathy intervention to see if empathy increases giving to low-status people over high-status people compared to a control group.

Alternatively, there may be no developmental change between toddlers and children's prosociality based on status. Instead, key differences between studies may have resulted in toddlers' and children's different prosocial responses based on status. One key difference between the toddler and child studies was the type of prosocial behavior measured. In the toddler studies, toddlers could *help* high- or low-status people whereas in the child studies, whereas children could *share* with high- or low-status people. Researchers have been careful to differentiate between different types of prosocial behavior (Brownell, Svetlova, Anderson, Nichols, & Drummond, 2013; Dunfield & Kuhlmeier, 2013; Dunfield, Kuhlmeier, O'Connell, & Kelley, 2011; Paulus, 2018; Warneken & Tomasello, 2009, 2013) and it is possible that different prosocial behaviors may have different underlying motivations (Paulus, 2018). For example,

helping may be motivated more by preferences and/or wanting to affiliate with others (Carpendale, Kettner, & Audet, 2015; Paulus, 2014; 2018). Through helping, toddlers have the ability to directly interact with someone in order to achieve a goal. It is possible that sharing may instead be motivated more by generosity or others' needs since sharing involves giving someone resources they may need.

Similarly, it might matter whether the type of prosocial behavior has any capacity to change inequities. For example, by sharing with others children can correct inequities, and therefore address the underlying status differences (e.g. giving more to poor individuals changes the status difference). However, helping may not address the underlying status difference in the same way. Even if toddlers or children were to help someone who is poor, that individual will remain poor. If this account is accurate, toddlers and children may only act prosocially to low- over high-status people if the prosocial behavior has the capacity to correct an inequity. In this vein, children should be significantly more likely to comfort high- over low-status people if this account is true because children cannot correct inequities by comforting others.

In agreement with unique motivations associated with helping and sharing, studies with adults have found that adults are more likely to *help* high-status over low-status people (Bickman, 1971; Goodman & Gareis, 1993), but will *give* more to low-status people than high-status people or control conditions when status information is not given [Brañas-Garza, 2006; Van Berkel, Crandall, Eidelman, & Blanchar, 2015 (note this is only when given time to consider who they want to give to)]. Therefore, it is possible that children would also help high-status people even though they gave more to low-status people and comforting may also have unique prosocial motivations.

5.5 IMPLICATIONS OF THIS WORK

5.5.1 *Implications for peer relationships and later biases*

This work finds that children had robust preferences for high-status individuals on all four dimensions of social status I investigated. This is important for parents and teachers to recognize because these preferences could impact early peer relationships, and peer relationships are crucial for self-worth, academic achievement, and health as previously discussed (Hattie, 2008; House et al., 1988; Parker et al., 2006). Parents and teachers should be cognizant of these preferences to ensure that all children are included.

Finding that children have preferences for high-status people from a young age can also provide important insights for why adults have social status biases. Specifically, the existence of preferences for high-status people in childhood suggests that adult's biases are not formed based on decades of experience with status, but instead may be ingrained as early as five years of age. It is therefore possible that underlying unconscious processes may be responsible for status biases in adulthood. In fact, a number of studies using creative methods with adults have found that humans likely have underlying biases for high- over low-status people. In a series of studies, adults were more likely to endorse social status hierarchies when inebriated, when they were under a cognitive load, and when there was time pressure suggesting that adults have automatic processes endorsing status hierarchies (Van Berkel et al., 2015). Further evidence that unconscious processes favor high-status over low-status people come from studies using the IAT. Specifically, adults have implicit pro-rich attitudes over poor people (Horowitz & Dovidio, 2017). Researchers have also found that adults are unaware of the powerful effect social status has on their own decision making and behavior (for a review see Smith & Galinsky, 2010). Taken together, this dissertation adds to the growing body of research suggesting that social

status influences decision making, preferences, and behavior, and the influence of social status has roots from a young age.

5.5.2 *Implications for group-based preferences*

This dissertation focused on *individual* social status differences, but there are also systematic group-based status differences that children pick up on. For example, in the United States White men hold a disproportionate number of CEO positions at fortune 500 companies; in 2014 only 4.2% of companies were headed by women and only 3.8% of companies were headed by people of color (Cook & Glass, 2014). Perhaps unsurprising based on these statistics, children expect White individuals to be wealthier than Black individuals (Elenbaas & Killen, 2016; Mandalaywala, Tai, & Rhodes, 2019; Olson, Shutts, Kinzler, Weisman, 2012; Shutts, Kinzler, Katz, Tredoux, & Spelke, 2016), children predict that White people will have higher status occupations than Black people (Bigler, Averhart, & Liben, 2003), and children think that boys are higher status than girls (Mandalaywala et al., 2019).

Since children recognize group-based status differences and hold preferences based on status, early preferences for high-status people may also have implications for systematic group-based preferences. Past work has found that children also hold preferences for groups that are higher in status: for example, American (Baron & Banaji, 2006) and South African children prefer White over Black individuals (Olson et al., 2012; Shutts, Kinzler, Katz, Tredoux, & Spelke, 2011). Social status differences may be one reason why children hold group-based preferences. In this dissertation I found that children had robust preferences for high-status people regardless of the dimension of status tested, thus it is possible that children prefer certain groups over others because of differences in social status.

Past research has supported the possibility that social status differences can partially explain group-based preferences. For example, researchers have found that children who hold stronger preferences for White over Black people are more likely to associate White people with higher status (Olson et al., 2012). Additionally, in novel groups contexts, children form stronger preferences for their own group when their group was of higher status than other groups (Bigler, Brown, & Markell, 2001) and prefer novel wealthy groups over novel poor groups (Horowitz, Shutts, Olson, 2014). Therefore, one potential way to ameliorate group-based biases could be to reduce social status differences between groups.

5.5.3 *Implications for the underlying motivations of prosocial behavior*

Researchers have posited a number of different theories that explain the underlying motivations of prosocial behavior when it first emerges, and this dissertation can contribute to these debates. One theory for the origins of prosociality proposes that prosocial behavior is initially motivated altruistically; infants and toddlers help because they are intrinsically motivated to help and want to alleviate others' needs (Hepach, Vaish, Grossman, & Tomasello, 2016; Hepach, Vaish, & Tomasello, 2012; Warneken & Tomasello, 2006; 2008). However, this and other work suggest that altruism alone does not explain early prosocial behavior. In particular, if prosocial behavior was only motivated by wanting to alleviate others' needs, infants and toddlers should not engage in selective helping unless they were helping someone with a greater need. However, in Chapter 2 of this dissertation I found that toddlers were significantly more likely to help previously resource rich over resource poor people. Other work has also found that toddlers will engage in selective helping such that 21-month-old toddlers are more likely to help people with positive over negative intensions (Dunfield & Kuhlmeier, 2010), 25-month-old toddlers help people who are fair over people who are unfair (Surian & Franchin,

2017), and 26-month-old toddlers will help people who are prosocial over people who are antisocial to others (Dahl, Schuck, & Campos, 2013).

Another possible explanation for early prosociality is that prosociality is motivated out of a desire for social interaction. Infants, toddlers, and young children may help because they want to interact and affiliate with specific people over others (Carpendale, et al., 2015; Paulus, 2014; 2018). This explanation fits with what I found in toddlerhood and with the previous literature. Specifically, it makes sense to affiliate and interact with fair over unfair people, prosocial people over antisocial people, and rich people over poor people. It is possible that early prosocial behavior is primarily motivated based on a desire to affiliate with certain people over others.

In addition to informing debates about the primary motivation for early prosociality, this work also suggests that there may be a developmental change in early prosocial motivations. Even though toddlers helped resource-rich high-status people, 5- and 6-year-old children helped low- over high-status people. Additionally, in other work investigating group-based inequities, young children have been found to perpetuate inequities whereas older children will correct inequities and give to groups with less (Elenbaas & Killen, 2016; Elenbaas, Rizzo, Cooley, & Killen, 2016; Olson, Dweck, Spelke, Banaji, 2011; Rizzo & Killen, 2016). Thus, initially, prosocial behavior may be motivated more by wanting to interact or affiliate with some people over others rather than being motivated out of concern for others' needs. However, with age, children may be motivated more by others' needs.

5.6 LIMITATIONS AND FUTURE DIRECTIONS

Overall these findings provide a clear existence proof that toddlers and children recognize and use social status information from a young age, but it is unclear how ecologically valid these results are. In all three papers, toddlers and children received different social status information

than they would likely see in the world. For example, in all three papers everything was controlled for and the same across the high- and low-status characters except for differences in social status. In the world, people likely differ in many ways (not just differing in status) so it is possible that these effects are overestimated. Alternatively, these effects may be underestimated because in the real-world status differences are likely pervasive and not just shown for a minute or two. In the future, I could test these effects in the real-world. For example, I could investigate children's preferences and prosociality for high- and low-status peers to see if I find similar results. This could help researchers, parents, and educators to gain a better understanding of how social status operates in the real world and non-experimental settings. I could also investigate how repeated status cues impact early preferences and prosociality as well as determine whether other factors (e.g. similarity, kindness, and familiarity) may or may not override children's underlying status preferences to gage the strength of these effects.

Future work can address another limitation of these studies: across papers and age groups it is difficult to draw comparisons. One of the most interesting findings of this dissertation is the differences in toddlers' and children's prosociality based on status; 18-month-old toddlers choose to help high-status wealthy people whereas 5- and 6-year-old children choose to give more to low-status people. However, as previously discussed, these differences might be due to differences in prosociality (in toddlers I assessed helping and in children I assessed sharing). Additionally, the toddler studies used real people versus the studies with children used stories of children which could differentially impact affiliative motivations for prosociality. Thus, it is unclear whether differences between studies are due to a true developmental change or based on other factors. Future work could test whether children will help high- or low-status people in the world. If children help low-status people, this would suggest that there may be an important

developmental change between toddlers and children. If, however, children help high-status people this would suggest that the type of prosociality (helping vs. sharing) may explain differences.

Other future work should also examine the generalizability of these effects to other samples of toddlers and children. The participants in these studies were all from the U.S. which is WEIRD (western, educated, industrialized, rich, and democratic; Henrich, Heine, & Norenzayan, 2010). Further, the participants were largely from high SES families. Since all of these studies were about social status, the status of the participants may matter for how children perceive and use status information. For example, it could be that children preferred high-status individuals because they related more to high-status people and perceived them to be part of their group. It could be that low-status children would prefer the low-status characters in these studies if preferences are primarily based on similarity or in-group membership or hold no preferences if status and in-group membership compete. In a novel group study where children were assigned to novel low- or high-status groups, researchers found that both status and group membership mattered. Children who were members of the high-status group had strong biases favoring their own high-status group, however, children who were members of the low-status group did not show strong biases for either group (Bigler, Spears Brown, & Markell, 2001). This suggests that one's own status likely will matter in these tasks. Future work should test a broader sample of participants to determine whether these findings hold for all children or whether other factors impact how children perceive and use social status information.

5.7 Conclusions

Taken together, these studies and past work find that an understanding of social status emerges early in ontogeny. Not only do infants and children recognize status differences from a

young age, but children also have robust preferences based on status. Here, children preferred high-status individuals regardless of whether status differences were based on wealth, physical dominance, decision making power, or prestige. Additionally, social status differences also impact early behavior. Specifically, toddlers are more likely to help high-status individuals whereas children are more likely to give to low-status people. This work suggests that social status may be an especially important aspect of human social interaction; from a young age, we pay attention to status differences, form preferences based on status, and act based on social status information.

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APPENDIX A: CHAPTER 3 SUPPLEMENTAL INFORMATION

Additional coding for Experiments 1-3 to determine why some toddlers choose not to help

Although our rates of non-helpers are similar to past research in which infants and toddlers had to make a forced choice decision to help one of two people (Buttelmann, Carpenter, & Tomasello, 2009), we wanted to determine why some toddlers chose not to help at all. Since past research suggests that shyness, in particular, is related to whether or not toddlers choose to help (Beier, Terrizzi, Woodward, & Larson, 2017) or share (Ziv & Sommerville, 2017), we had blind researchers code toddlers' behavior during the helping phase. They coded whether the toddler tried to get back into their parent's lap (yes or no) which might indicate that the toddler was shy or did not want to leave their parent. The researchers also coded whether they would consider the toddler shy on a scale from 1- 7 (1- not shy at all to- 7- extremely shy).

Across Experiments 1-3 we found that non-helpers exhibited more shy behaviors and were rated as significantly shyer than helpers during the helping task[5]. Non-helpers were significantly more likely to try to get back into their parent's laps (22 of 56) compared to helpers (2 of 68), $\chi^2(1) = 25.99$, $p < .001$, $\varphi = .46$. Additionally, non-helpers ($M = 3.61$, $SD = 1.75$) were rated as significantly shyer than helpers ($M = 1.18$, $SD = 0.57$), $t(126) = 11.01$, $p<.001$, $d = 1.87$[6]. Taken together, this additional coding suggests that one of the reasons toddlers choose not to help may be because they were shy or did not want to approach unknown actors in the moment.

[5]The results here are collapsed across all three experiments, but the same results were found when each Experiment was analyzed separately.

[6] Unfortunately, due to the camera angle, 5 helpers and 19 non-helpers were unable to be coded for parts of the helping phase in Experiment 2 and due to video failure and the camera angle, 1 helper and 3 non-helpers were unable to be coded for parts of the helping phase in Experiment 3.

APPENDIX B: CHAPTER 4 SUPPLEMENTAL INFORMATION

Pilot Study

Before beginning the main set of studies, we conducted a small pilot study (N=20) to assure that 4- and 5-year-old children (*M*=58.8 months, *SD*=6.31 months, 15 male) understood the key dimensions of social status that we aimed to assess in our work (wealth, physical dominance, decision making power, and prestige). In the pilot study, 20 vignettes were presented to 4- and 5-year-old children[7]. Each vignette involved reading a short story with corresponding pictures of one high status individual and one low status individual. For the wealth vignettes, children were asked "Who has more and better stuff?", in the physical dominance vignettes children were asked "Who is bigger and stronger?", in the decision-making power vignettes children were asked "Who gets to decide what to do and eat?", and in the prestige vignettes children were asked "Who do people pay attention to and follow?". Five vignettes were pilot tested for each of the four dimensions, and the four vignettes with the highest agreement were used in Study 1. Overall, children could correctly answer the pilot questions the majority of the time in accordance with their design (for the four vignettes used in each dimension: 97% correct for wealth, 94% correct for physical dominance, 83% correct for decision making power, and 86% correct for prestige).

[7] Additionally, *n*=10 3-year-olds came in for the pilot study. Since we did not include the 3-year-olds in Study 1, their pilot data is not included in these statistics.

The 16 Vignettes Used in Experiments 1-3 of Chapter 4

*Note that the gender of the children in the story were matched to participant gender, and there were four different counterbalance orders.

Wealth Vignettes

- This is Jessica. This is Rebecca. Jessica has lots of things. Jessica has lots of toys to play with, food to eat, and a place to live. Rebecca does not have very many things. Rebecca only has one toy, does not have a lot of food to eat, and does not have a place to live.
- This is Clarissa. This is Kristin. Clarissa only has one shirt and one pair of pants and she doesn't have many toys. Kristin has new clothes every month and she always has the newest toy.
- This is Emily. This is Amy. Emily goes on vacation with her family every month to a new place, where they get to do a lot of fun activities. Last spring break they went to Disneyworld. Amy and her family don't go on vacation because her parents have to work all the time. Last spring break Amy stayed home and watched tv.
- This is Karen. This is Lydia. Karen has a lot of food to eat and brings her own food to school. Karen has lots of snacks and never goes hungry. Lydia doesn't have a lot of food to eat outside of school food. Lydia does not have snacks to bring to school and is often hungry.

Physical Dominance Vignettes

- This is Zoe. This is Sydney. Zoe is stronger than Sydney. Zoe and Sydney like to play tug of war and try to get the rope closest to them. Since Zoe is stronger, she always wins and gets the rope.

- This is Mariah. This is Kate. Both Mariah and Kate are playing tetherball. Mariah is bigger and stronger than Kate. Because Mariah is bigger, she can grab the ball and always wins the game.
- This is Beth. This is Grace. Grace is taller than Beth. Both Beth and Grace really wanted to read a book on a tall shelf and tried to get it. Because Grace is taller, she was able to grab the book and read it. Beth didn't get to read the book.
- This is Rachel. This is Anna. Rachel and Anna are playing a game of basketball. Rachel is short and weak. Anna is tall and strong. Since Anna is tall and strong she can always block Rachel from making baskets and always wins the game.

Decision Making Power Vignettes

- This is Lucy. This is Diana. Lucy and Diana like to play games. Lucy wanted to play hide and go seek and Diana wanted to play tag. They talked about it and decided to play hide and go seek like Lucy wanted. On another day they wanted a snack and Lucy wanted pretzels, but Diana wanted goldfish. They talked it over and decided to eat pretzels like Lucy wanted.
- This is Sandra. This is Carrie. Sandra doesn't get to choose what she'll play because Carrie always decides for her. Carrie always gets to decide what games people will play during playtime, and Carrie always wants to play catch. Sandra and Carrie play catch.
- This is Cassandra. This is Maddy. Cassandra wanted to go outside and play tag. Maddy wanted to stay inside and read a book. Maddy asked Cassandra if they could read books, but Cassandra said they were playing tag. Both Cassandra and Maddy played tag because Cassandra said so.

- This is Tara. This is Helen. Tara and Helen wanted to eat a snack. Tara wanted chips, but Helen wanted to eat Oreos. Tara doesn't get to choose what to eat because Helen always decides. Since Helen wanted oreos, Tara and Helen ate oreos.

Prestige Vignettes

- This is Debbie. This is Mackenzie. Both Debbie and Mackenzie sometimes draw pictures. Almost no one watches Debbie draw or looks at Debbie's pictures. Lots of people watch Mackenzie draw pictures and look at her pictures. Debbie and Mackenzie also like to build with blocks. No one watches Debbie build with blocks, but lots of people watch Mackenzie build with blocks.
- This is April. This is Stacey. April told everyone apples were better than oranges, and other kids now prefer to eat apples. Stacey told everyone that oranges were better than apples, but no one started eating oranges. April also told everyone that goldfish was better than pretzels, but Stacey told everyone that pretzels were better than goldfish. Everyone decided to eat goldfish like April said.
- This is Paige. This is Courtney. Paige used the paper cone as a nose, but no one saw Paige because they were only watching Courtney. Courtney used a paper cone as a hat, and other kids started watching her play with the paper cone. Because Courtney used it as a hat, other kids decided to use the paper cone as a hat. None of the kids used the paper cone as a nose.
- This is Claire. This is Hailey. Claire and Hailey like to read books out loud. Both Claire and Hailey told their class that they were going to read a book. No one listened to Claire read out loud. Lots of people went to listen to Hailey read out loud.

Chapter 4, Study 1 Additional Analyses

Counterbalance effects.

Analyses from participants who were asked "Who do you like best" first. As mentioned in the manuscript, children who were first asked "who they liked best" significantly identified and preferred high-status individuals when the four dimensions were pooled together. Examining the data separately by dimension the same pattern of results was found. Children who were first asked "Who they like best" significantly preferred the high-status character in the wealth dimension ($t(24)=2.222$, $p=.036$, $d=.44$), physical dominance dimension ($t(24)=2.370$, $p=.026$, $d=.47$), decision making power dimension ($t(24)=2.585$, $p=.016$, $d=.52$), and prestige dimension ($t(24)=2.281$, $p=.032$, $d=.46$).

Additionally, children who were asked second "who is in charge" identified the high-status individual as in charge significantly more than chance. This was true both when the dimensions are pooled together (reported in the manuscript), and when analyzed separately by dimension: wealth ($t(24)=2.854$, $p=.009$, $d=.57$), physical dominance ($t(24)=3.674$, $p=.001$, $d=.74$), decision making power ($t(24)=3.578$, $p=.002$, $d=.72$), and prestige ($t(24)=3.226$, $p=.004$, $d=.65$).

Analyses from participants who were asked "Who is in charge" first. Unlike participants who were asked "who they like best" first, children who were first asked "who is in charge" did not have a significant preference for high-or low-status individuals when the four dimensions were pooled together. Similarly, they had no preferences in any of the dimensions when analyzed separately: wealth ($t(22)=.170$, $p=.866$, $d=.04$), physical dominance ($t(22)=.738$, $p=.468$, $d=.15$), decision making ($t(22)=1.318$, $p=.201$, $d=.275$), and prestige ($t(22)=.472$, $p=.641$, $d=.098$).

However, children did significantly identify the high-status individual as being in charge in all four dimensions: wealth ($t(22)=6.423$, $p<.001$, $d=1.34$), physical dominance ($t(22)=8.158$, $p<.001$, $d=1.70$), decision making power ($t(22)=10.655$, $p<.001$, $d=2.22$), and prestige ($t(22)=5.009$, $p<.001$, $d=1.04$). This provides additional evidence that the order in which children were asked about their preferences and to identify who is in charge mattered for their responses.