Washington University in St. Louis
Washington University Open Scholarship

Arts & Sciences Electronic Theses and Dissertations

Arts & Sciences

Spring 5-15-2015

Social Influences on Children's Option Valuations

Laura Pape Hennefield
Washington University in St. Louis

Follow this and additional works at: https://openscholarship.wustl.edu/art_sci_etds

 Part of the Psychology Commons

Recommended Citation

Hennefield, Laura Pape, "Social Influences on Children's Option Valuations" (2015). *Arts & Sciences Electronic Theses and Dissertations*. 467.
https://openscholarship.wustl.edu/art_sci_etds/467

This Dissertation is brought to you for free and open access by the Arts & Sciences at Washington University Open Scholarship. It has been accepted for inclusion in Arts & Sciences Electronic Theses and Dissertations by an authorized administrator of Washington University Open Scholarship. For more information, please contact digital@wumail.wustl.edu.

WASHINGTON UNIVERSITY IN ST. LOUIS

Department of Psychology

Dissertation Examination Committee:
Lori Markson, Chair
Pascal Boyer
Todd Braver
Julie Bugg
Janet Duchek
Camillo Padoa-Schioppa

Social Influences on Children's Option Valuations

by
Laura Pape Hennefield

A dissertation presented to the
Graduate School of Arts & Sciences
of Washington University in
partial fulfillment of the
requirements for the degree
of Doctor of Philosophy

May 2015

St. Louis, Missouri

© 2015, Laura Hennefield

Table of Contents

List of Figures

Acknowledgments

First and foremost, I want to express my deepest gratitude to my advisor, Lori Markson. Lori has provided unwavering support throughout my graduate career, always expected the best from me, and constantly challenged me to be a better scientist. She helped me create opportunities to succeed, taught me to accept rejection as part of being an academic, and her unyielding enthusiasm for developmental research has been inspirational throughout my graduate career. I look forward to our continued collaboration and friendship.

I also want to thank Janet Duchek for her consistent encouragement and guidance. Jan has been instrumental to my growth as a scholar and a teacher. Jan has a reputation for being both tough and fair in the classroom, which is a combination of qualities I highly admire. It was a privilege to witness her teaching style firsthand, and through the teaching opportunities she provided me with, and her invaluable feedback, I have begun to learn how to cultivate those qualities in my own teaching.

Many thanks to my core dissertation committee, Todd Braver and Julie Bugg, for their guidance and thoughtful feedback throughout this project, and Camillo Padoa-Shioppa for his helpful insight and suggestions. I also thank Pascal Boyer for his consistent enthusiasm toward my research, and his perspective and encouragement to view my research through an evolutionary lens. Thanks also to Daniel Povinelli for his insightful seminar on comparative cognition and numerous scientific discussions. In a somewhat paradoxical way, the insight I have gained from Danny's systematic approach to research has made me less cynical and more confident in my own abilities to conduct sound and meaningful research.

The members of Cognition and Development Lab have also been a tremendous support. My graduate studies would not have been as productive – or enjoyable – without each of them. Casey Sullivan welcomed me to the lab, spent countless hours listening to me devise my early

research projects, taught me about perseverance, and the joys of writing at local coffee shops. Narges Afshordi taught me that it's possible to be both kind and stubborn at the same time, and I have always admired her for that. Grace Hwang brought new energy and ideas into the lab, has patiently served as a sounding board for much of the work in this dissertation, and is an awesome conference travel partner. Natasha Marrus introduced me to the clinical side of psychology, and we have had many frank conversations about life and science and everything in between. I cannot begin to express how integral each of these individuals have been in my graduate journey, and want to thank each of them for their support and friendship.

I also want thank my friends and family for their constant love and support. Melissa Kasten, Britten Rollo, and Jessica Molina keep me grounded in life outside of academia. My brother, Andrew Hennefield, has always been there for me, and his excitement toward my plans and ideas is highly motivational. Garett Johnson has been a significant source of support over the last year, always ready to celebrate the good times and put life in perspective. Jonathan Jackson, with his unrelenting optimism toward my work and goals, had become a close friend and valued colleague. Dustin Martinez, a constant source of support, is always willing to apply his deep and oddly specific knowledge of philosophy of science and literary criticism to my ideas, which makes for some very interesting dinner conversations. I would also be remiss if I did not thank him for proofing many (many!) drafts of papers and grants I have written in recent years.

Finally, I thank my parents, Susan and James Hennefield, who raised me with an appreciation of science, nature, education, and curiosity. None of this would have been possible without their love, encouragement, and unwavering support.

Laura Hennefield

Washington University in St. Louis

May 2015

ABSTRACT OF THE DISSERTATION

Social Influences on Children's Option Valuations

by

Laura Pape Hennefield

Doctor of Philosophy in Psychology

Washington University in St. Louis, 2015

Professor Lori Markson, Chair

Children use a variety of strategies to determine the relative value of the objects they encounter, ranging from simple heuristics to the integration of information from multiple sources. Do children also incorporate social information – specifically, information pertaining to others' preferences – into their object valuations? Valuation is an important component of economic exchange, and is key to assessing how resources are fairly distributed or favors reciprocated. As humans often need to make critical decisions with limited information, garnering information about value via social sources might be an adaptive strategy. This dissertation has two primary goals: (1) to develop methodology to assess value discrimination in young children, and (2) to investigate how young children's resource valuations – and subsequent preferences – might be influenced by the preferences of their peers. These goals were realized across four empirical studies. The study presented in Chapter 2 used an established resource distribution methodology, the Dictator Game, to test whether 4-year-old children's preferences were influenced by the preferences of their peers. Children observed, via video, four peers sequentially display the same preference for one of two stickers. Each peer expressed liking one sticker and disliking the other. Subsequently, in the Dictator Game, children kept more stickers their peers liked than stickers their peers disliked, suggesting that children extracted *informational* content about the value of

the resources from their peers and used that to guide their own preferences. The studies presented in Chapter 3 aimed to clarify these findings, extend this research to younger children, and develop new resource distribution tasks to assess value discrimination. Three studies investigated whether 3-year-old children differentially distribute two resources (stickers) based on an a priori preference for one of the resources (Study 1), use peers' preferences (e.g., their likes and dislikes) to inform their valuations and subsequent resource distribution when children do not have an a priori preference for a resource (Study 2), and incorporate peers' preferences into their own choices (Study 3). The results suggest that young children used their a priori, explicitly stated, preferences to differentially distribute the resources, giving their favorite option to a prosocial agent who was presumably more deserving than the other agent. Further, after viewing four peers express a consistent preference for one option over another, children appeared to devalue the option their peers disliked, as they systematically avoided selecting it for a prosocial agent, a new child, and themselves. Interestingly, in the resource distribution tasks, girls, but not boys, appeared to increase their value of the option their peers liked, as they gave more liked than neutral (non-valenced) resources to the prosocial agents. Finally, children chose equally between the liked and neutral resources as their own favorite, while avoiding the disliked resources. These findings suggest that children's resource valuations are informed by the preferences of their peers. Further, it is possible that subjective negative information (e.g., others' dislikes) plays a privileged role in influencing children's choice behavior. These findings are discussed in the context of a negativity bias, and several explanations are considered to explain the gender difference. Together, the studies provide new insight into children's early economic reasoning, and highlight how peer preferences influence children's developing valuations.

Chapter 1: Introduction

Children use a variety of strategies to determine the relative value of options they encounter, ranging from simple heuristics to the integration of information from multiple sources. Do children also incorporate social information – specifically, information acquired via observing others' preferences – into their option valuations? Valuation is an important component of economic exchange, and is key to assessing how resources are fairly distributed or favors reciprocated. That even young children appear to have some understanding of both fairness (e.g., LoBue, Nishida, Chiong, DeLoache, & Haidt, 2009; Blake & McAuliffe, 2011; Geraci & Surian, 2011; Baumard, Mascaro, & Chevallier, 2012; Sloane, Baillargeon, & Premack, 2012; Sommerville, Schmidt, Yun, & Burns, 2013) and reciprocity (e.g., Lucas, Wagner, & Chow, 2008; Olson & Spelke, 2008; Engelmann, Over, Herrmann, & Tomasello, 2013; House, Henrich, Sarnecka, & Silk, 2013; Warneken & Tomasello, 2013) suggests that an ability to assign value to options is present from a young age. Further, as humans often need to make critical decisions with limited information, garnering information about value via social sources might be an adaptive strategy. Previous studies indicate that young children are highly motivated to attend to and learn from the actions of others. Whether this includes learning about the value of options via observing others' preferences remains unknown.

Value, for the present purpose, is defined as the relative importance, usefulness, or worth of an option (e.g., a good or service). Value discrimination is a comparison of two or more options that vary on multiple dimensions; economic choice is the decision that results from such comparison. Thus, values, as such, are computed at the time a choice is made, based on multiple dimensions, including attributes of the option, quantity, temporal availability, and current motivational state (e.g., Padoa-Schioppa, 2011). This research has two primary goals: (1) to

develop methodology to assess value discrimination in young children, and (2) to investigate whether one particular type of social information – other children's preferences – factors into the relative subjective value that children assign to options.

This work focused on the preferences of other children for two reasons. First, there is substantial evidence that children are not indiscriminate learners – they consider factors such as past reliability (e.g., Birch, Vauthier, & Bloom, 2008; Jaswal & Neely, 2006; Koenig & Harris, 2005), expertise (Keil, Stein, Webb, Billings, & Rozenblit, 2008), consensus with a majority (Corriveau, Fusaro, & Harris, 2009), and even group membership (Kinzler, Corriveau, & Harris, 2010), in determining from whom to learn. Further, children are also able to consider the content of the material, for example, whether they need information about toys or food, when determining whether a child or an adult is a better source of information (VanderBorght & Jaswal, 2009). Thus, children might selectively learn from the preferences, and in particular the *object* preferences, of their peers over those of an adult.

Second, peers are critical to the fabric of young children's social environment. Preschool children form complex social networks, which include strong reciprocal friendships with a limited number of peers, relationships with friends of friends, and hierarchies of popularity (Schaefer, Light, Fabes, Hanish, & Martin, 2010). There is also emerging evidence that children engage in behaviors that strengthen social connections and group membership, such as conformity (Haun & Tomasello, 2011) and reputation management (Engelmann, Herrmann, & Tomasello, 2012; Leimgruber, Shaw, Santos, & Olson, 2012; Engelmann et al., 2013). Research on children's learning in social contexts has primarily focused on factual information that children learn from adults (e.g., Sobel & Kushnir, 2013). However, as peers comprise an essential component of children's social networks, understanding the contexts and type of

information that children might learn from peers is crucial to a comprehensive understanding of social cognitive development. The present research aims to address this gap and provide insight into one context – preferences – in which children might learn from their peers.

This dissertation is divided into four chapters. Chapter 1 provides a general introduction and discusses several pertinent methodological considerations. Chapters 2 and 3 are presented as empirical manuscripts. The studies in Chapter 2 use an established resource distribution task, the Dictator Game, to assess whether 4-year-old children's preferences are influenced by the preferences of their peers. The studies in Chapter 3 introduce two new resources distribution tasks adapted from the fairness and prosociality literature to assess value discrimination in 3-year-old children. The first of three studies uses this value discrimination methodology to assess whether children differentially distribute two resources (stickers) based on an a priori preference for one of the resources. The second study uses this methodology to test whether children utilize information garnered from their peers' preferences (e.g., their likes and dislikes) to inform their valuations of the resources. The third study investigates whether children incorporate peers' preferences into their own choices. Chapter 4 provides a synthesis of this work, insight into future directions, and general conclusions.

Overview of Value Discrimination Methodologies

If young children assign values to options, and if this value is potentially influenced by other's preferences, a key question concerns *how* to elicit these value judgments. There is a long history of eliciting value judgments from adults in cognitive and evolutionary psychology, though most traditional adult valuation methodologies are not feasible to use with children. Many tasks have complicated instructions that require advanced verbal comprehension and task demands that are too complex for young children. One seemingly straightforward approach to

assessing value in adults, asking which option someone would pay more money for, becomes substantially more complicated to extend to young children because of their tenuous grasp of the symbolic nature of money or tokens. Another common methodological approach utilizes temporal discounting, which assesses option value as a function of availability at particular points in time (e.g., one smaller reward now versus a larger reward later; see Schultz, 2010, for a review). However, temporal discounting tasks are complex, sensitive to individual differences in self-control and cognitive control, and findings from studies with children are sparse and inconsistent (see Scheres, Tontsch, Thoeny, & Sumiya, 2014, for a review). Nevertheless, there is one methodological approach, resource distribution, which is widely utilized in the extant adult literature and also holds promise for use in value discrimination in children.

Resource distribution tasks have become increasingly popular in developmental research as a means of investigating fairness and prosocial behavior in young children. One task in particular, the Dictator Game (DG), has been used with children between 3 to 9 years of age to test questions pertaining to altruism and fairness (Aguilar-Pardo, Martínez-Arias, & Colmenares, 2013; Benenson, Pascoe, & Radmore, 2007; Chen, Zhu, & Chen, 2013; Kogut, 2012; Lucas, Wagner, & Chow, 2008), moral emotions such as guilt and sympathy (Gummerum, Hanoch, Keller, Parsons, & Hummel, 2010; Ongley & Malti, 2014), and ownership and group membership (Benozio & Diesendruck, 2015). Further, in one of the only studies to directly assess value discrimination in young children, Blake and Rand (2010) used the DG to test whether children's own preferences for resources influenced their distribution of those resources.

In the DG participants are given a finite set of resources to distribute between themselves and another individual (the recipient). A utilitarian model would predict that the rational course of action to maximize personal gains is to keep all of the resources for oneself. However, there is

robust evidence to the contrary; a meta-analysis of more than 100 published manuscripts revealed that adults in the DG distribute an average of 25-35% of the resources to the recipient (Engel, 2011). Similar findings have been reported in children (e.g., Blake & Rand, 2010; Gummerum et al., 2010; Ongley & Malti, 2014), however, one developmental trend has emerged. Younger children tend to keep more resources than older children (Benenson et al., 2007), and specifically, younger children keep *all* of the resources more frequently than older children (Blake & Rand; Gummerum et al.; Ongley & Malti). However, whether younger children keep all of the resources due to increased levels of selfishness, task demands, and/or because they value the resources more highly than older children remains unknown.

Blake and Rand (2010) used the DG to investigate 3- to 6-year-old children's distribution patterns for resources that (ostensibly) differed in value. Children first identified their favorite and least-favorite stickers, and were then given either 10 of their favorite or 10 of their least-favorite stickers to distribute between themselves and another child. They found that children gave fewer of their favorite stickers to the other child, suggesting they assigned a higher value to their favorites stickers and found giving them away to be more costly. In contrast, children gave significantly more of their least-favorite stickers, indicating a willingness to share provided the cost was not too high. Further, Blake and Rand found that a majority of 4-year-old children distributed at least one sticker, and the proportion of favorite and least-favorite stickers those children distributed did not differ from older children. Thus, these findings suggest the DG is a potentially feasible measure for assessing value discrimination in 4-year-old children.

Importantly, if the DG can be used to assess value discrimination between resources for which children hold an a priori preference, then it can presumably also be used to assess whether children's resource valuation *changes* as a function of an experimental manipulation. The study

presented in Chapter 2 uses the DG to assess whether 4-year-old children differentially distribute resources for which they observed *other children* like or dislike. Children completed two rounds of the DG; one round with 10 stickers their peers liked and one round with 10 stickers their peers disliked. If peers preferences influenced children's own preferences, it was expected that children would keep more of the stickers their peers liked than stickers their peers disliked.

The DG paradigm was chosen for the present research because it was previously used to test value discrimination in children. However, it has several significant limitations. The first limitation is that it tests value discrimination via preferences, with the assumption that children prefer resources of higher value and thus will opt to keep more of those resources for themselves. Whereas preferences are likely to *reflect* the underlying value assigned to options, assessing value discrimination via preferences might incidentally test a multitude of factors beyond value acquisition via peers' preferences. For children's preferences to be influenced by the preferences of their peers, children must first recognize that their peers' preferences (their likes and dislikes) provide meaningful information about the values of the options. Then children must factor that value information into their own subjective valuations, as one of the many dimensions that comprise value. If these other dimensions factor heavily into children's preferences, that could substantially reduce any weight children place on the information provided via peers, making their influence difficult to detect in an experimental manipulation.

A second limitation of the DG concerns its usefulness to capture fine-grained discriminations between value judgments. Allotting 10 resources to children to distribute in each of two rounds of the DG could result in a myriad of outcomes. Thus, this method has the *potential* to capture large differences in resource valuation. For example, if children tended to keep all 10 stickers their peers liked and give away all 10 stickers their peers disliked, that would

provide strong evidence that children were using others' preferences to inform their behavior. However, the DG allows children to keep all, half, or none of the resources in each round, and between rounds children can keep equivalent quantities of resources. Each of these outcomes is problematic from the perspective of trying to evaluate value discrimination. Previous research already indicates that young children often keep all of the resources for themselves (e.g., Benenson et al., 2007; Blake and Rand, 2010). Thus, it is possible that children could assign a higher value to one of the two options, yet still keep all of them. Furthermore, *any* equal distribution within or between rounds will suffer that same difficulty with interpretation. Thus, whereas assessing children's distribution patterns when they are given the freedom to distribute multiple resources in multiple ways could indicate that children strongly favor one resource over the other, it is also possible that children could distribute resources in such a way (i.e., equal distributions) that cannot provide information about their resource valuation.

A third limitation pertains to the feasibility of using the DG with children under 4 years of age. When Blake and Rand (2010) assessed distribution patterns between children's favorite and least-favorite sticker, they found no age differences in the pattern of distribution among those children who distributed at least one sticker. However, fewer than 50% of the 3-year-old children they tested distributed at least one sticker, whereas more than 75% of the 6-year-old children distributed at least one sticker. Thus, whereas the DG might be a feasible resource distribution method to use with older children, the lack of variability in younger children's responses makes it problematic to use this task with 3-year-old children.

Finally, in the DG, children must contend with competing desires to keep resources for themselves and behave prosocially by giving resources to the recipient. Whereas these competing demands are a key function of the DG as a method of assessing fairness and prosocial

behavior, they are not necessary to assess value discrimination. Indeed, these demands might serve to add substantial noise, rendering the DG ill suited as a measure of value discrimination. Thus, despite the benefits of using an established methodology, the limitations of the DG also indicate a need to develop additional measures to assess value discrimination in young children. Ideally, these tasks would have reduced task demands, a reduced range of potential responses, be appropriate for children younger than 4 years of age, and assess value in a way that does not necessarily invoke children's preferences.

There are several measures that meet some of the aforementioned criteria. One measure is to ask children which options they would choose for themselves, either to play with temporarily or to keep. Another would be to assess which options they would work harder, faster, or expend more energy on to acquire. However, both of these methodologies are based on the assumption that children will necessarily want to acquire resources of higher value for themselves. Whereas this is presumed to generally be true, it is also possible that children can understand the generally agreed upon value of an option without necessarily desiring that option for themselves. In contrast, there is one resource distribution methodology – having children distribute resources to others – that eliminates children's own desires to acquire the resources from their decision-making processes. Further, this method could be simplified to children distributing two resources between two agents. This would serve to reduce task demands, the potential range of responses, and be appropriate for testing value discrimination in 3-year-old children.

In recent years, several resource distribution tasks designed to assess fairness and prosociality in children younger than 4 years of age have been developed. The general findings from these studies are that young children, in the absence of other information, expect that a set quantity of identical resources will be distributed equally between recipients (e.g., Geraci &

Surian, 2011; Sloane et al., 2012; Sommerville et al., 2013). Similar findings have emerged from behavioral studies. When children are given the opportunity to distribute even quantities of resources, they tend to divide the resources equally between the recipients (e.g., Kenward & Dahl, 2011; Olson & Spelke, 2008). Further, there are several studies in which researchers manipulated both the quantity of resources to be distributed and characteristics of the recipients. These studies are based on two assumptions: (1) that a larger quantity is more valuable than a smaller quantity, and (2) that children will differentially choose to reward a prosocial agent over one who was not prosocial (or, conversely, punish the agent who was not prosocial). Kenward and Dahl found that 4.5-year-old children gave more biscuits to a puppet who helped an agent than to one who hindered that agent when the children were allotted an odd number of biscuits to distribute. Children justified their actions with statements about the prosocial and antisocial behaviors of each puppet, suggesting they chose to reward the prosocial puppet with more biscuits and/or punish the antisocial puppet with fewer biscuits. In a similar merit-based task, Baumard, Mascaro, and Chevallier (2012) found that 3- and 4-year-old children opted to give a bigger cookie to a person who worked harder to bake the cookies and a smaller cookie to a person who did not work as hard. Here, the researchers operated under the assumption that children would find the bigger cookie to be of higher value, and concluded that children used the larger cookie to reward the person who worked harder. Together, these findings suggest that children can use resource value, as indicated by resource quantity, to differentially distribute resources between two agents. Specifically, children appear to use resource value to reward prosocial agents and/or punish non-prosocial agents. Thus, it might be possible to employ these types of tasks to assess value discrimination in circumstances in which the resources do not differ in quantity, but instead differ on some other dimension of value.

The studies presented in Chapter 3 use methods adapted from the fairness and prosociality literature to test children's resource distribution across two independent value discrimination tasks. The methods are based on the assumption that children will use resource value to reward prosocial agents and/or punish non-prosocial agents. In each task, children viewed one agent who behaved in a prosocial manner (e.g., gave a gift, cleaned up blocks), and is thus potentially deserving of a higher-valued reward; the other agent did not behave prosocially (e.g., did not give a gift, did not clean up blocks). Then children distributed two resources between the two agents.

The first study in Chapter 3 directly tests the assumption that children would distribute an (ostensibly) higher-valued resource to a prosocial agent by investigating how 3-year-old children distribute two stickers – their a priori favorite and least-favorite stickers – between the prosocial and non-prosocial agent. If use their subjective value to differentially distribute the stickers, it was expected that children would distribute their favorite – higher-valued – sticker to the prosocial agent in both tasks. The second study investigates whether 3-year-old children differentially distribute stickers they observed *other children* like or dislike. If other children's preferences influenced children's valuations of the stickers, it was expected that children would differentially distribute the sticker liked by other children to the prosocial agent, and the sticker disliked by other children to the non-prosocial agent. Crucially, in these tasks, children distributed either the liked sticker *or* the disliked sticker (each contrasted with a new, neutral sticker). By not directly contrasting the liked and disliked stickers, it is possible to assess whether children might increase their valuation of the liked sticker, decrease their valuation of the disliked sticker, or both. The third study in Chapter 3 investigates whether other children's preferences influence children's own preferences. After children observed which stickers their

peers liked and disliked, children were directly asked which sticker they prefer. Children were also asked which sticker they thought a new child would prefer. This direct approach was designed to complement the indirect measures implemented in the first two studies. Together, these studies provide new insight into 3-year-old children's economic reasoning and highlight several ways in which the preferences of peers influence children's developing valuations.

The studies that comprise this dissertation aimed to establish new methodologies for assessing value discrimination in preschool-aged children, and used these methodologies to determine whether children assign stable relative to objects and whether their valuations of objects can be influenced by their peers preferences. The work in this dissertation was conceived of and carried out by Laura Hennefield. Chapters 2 and 3 are presented as empirical manuscripts, which will be revised for publication with Laura Hennefield as the first author and Lori Markson as the second author. Laura Hennefield generated the theoretical questions of interest, determined the experimental design, conducted all data collection and analyses, and wrote up the findings. Lori Markson was involved in discussions of this project at every level, from the theoretical underpinnings to methodological design and data analyses, offered invaluable advice, and provided feedback on written drafts of the manuscripts.

References

Aguilar-Pardo, D., Martínez-Arias, R., & Colmenares, F. (2013). The role of inhibition in young children's altruistic behaviour. *Cognitive Processing*, *14*(3), 301–307. doi:10.1007/s10339-013-0552-6

Baumard, N., Mascaro, O., & Chevallier, C. (2012). Preschoolers are able to take merit into account when distributing goods. *Developmental Psychology*, *48*(2), 492–498. doi:10.1037/a0026598

Benenson, J. F., Pascoe, J., & Radmore, N. (2007). Children's altruistic behavior in the dictator game. *Evolution and Human Behavior*, *28*(3), 168–175. doi:10.1016/j.evolhumbehav.2006.10.003

Benozio, A., & Diesendruck, G. (2015). Parochialism in preschool boys' resource allocation. *Evolution and Human Behavior*, 1–9. doi:10.1016/j.evolhumbehav.2014.12.002

Birch, S. A. J., Vauthier, S. A., & Bloom, P. (2008). Three- and four-year-olds spontaneously use others' past performance to guide their learning. *Cognition*, *107*(3), 1018–1034. doi:10.1016/j.cognition.2007.12.008

Blake, P. R., & McAuliffe, K. (2011). "I had so much it didn't seem fair": Eight-year-olds reject two forms of inequity. *Cognition*, *120*(2), 215–224. doi:10.1016/j.cognition.2011.04.006

Blake, P. R., & Rand, D. G. (2010). Currency value moderates equity preference among young children. *Evolution and Human Behavior*, 1–11. doi:10.1016/j.evolhumbehav.2009.06.012

Chen, Y., Zhu, L., & Chen, Z. (2013). Family income affects children's altruistic behavior in the dictator game. *PLoS ONE*, *8*(11), 1–8. doi:10.1371/journal.pone.0080419

Corriveau, K. H., Fusaro, M., & Harris, P. L. (2009). Going with the flow: Preschoolers prefer nondissenters as informants. *Psychological Science*, *20*(3), 372–377. doi:10.1111/j.1467-9280.2009.02291.x

Engel, C. (2011). Dictator games: A meta study. *Experimental Economics*, *14*(4), 583–610. doi:10.1007/s10683-011-9283-7

Engelmann, J. M., Herrmann, E., & Tomasello, M. (2012). Five-year olds, but not chimpanzees, attempt to manage their reputations. *PLoS One, 7*, e48433. doi:10.1371/journal.pone.0048433

Engelmann, J. M., Over, H., Herrmann, E., & Tomasello, M. (2013). Young children care more about their reputation with ingroup members and potential reciprocators. *Developmental Science*, *16*(6), 952–958. doi:10.1111/desc.12086

Geraci, A., & Surian, L. (2011). The developmental roots of fairness: Infants' reactions to equal and unequal distributions of resources. *Developmental Science*, *14*(5), 1012–1020. doi:10.1111/j.1467-7687.2011.01048.x

Gummerum, M., Hanoch, Y., Keller, M., Parsons, K., & Hummel, A. (2010). Preschoolers' allocations in the dictator game: The role of moral emotions. *Journal of Economic Psychology*, *31*(1), 25–34. doi:10.1016/j.joep.2009.09.002

Haun, D. B. M., & Tomasello, M. (2011). Conformity to peer pressure in preschool children. *Child Development*, *82*(6), 1759–1767. doi:10.1111/j.1467-8624.2011.01666.x

House, B., Henrich, J., Sarnecka, B., & Silk, J. B. (2013). The development of contingent reciprocity in children. *Evolution and Human Behavior*, *34*(2), 86–93. doi:10.1016/j.evolhumbehav.2012.10.001

Jaswal, V. K., & Neely, L. A. (2006). Adults don't always know best: Preschoolers use past reliability over age when learning new words. *Psychological Science*, *17*(9), 757–758. doi:10.1111/j.1467-9280.2006.01778.x

Keil, F., Stein, C., Webb, L., Billings, V. D., & Rozenblit, L. (2008). Discerning the division of cognitive labor: An emerging understanding of how knowledge is clustered in other minds. *Cognitive Science*, *32*(2), 259–300. doi:10.1080/03640210701863339

Kenward, B., & Dahl, M. (2011). Preschoolers distribute scarce resources according to the moral valence of recipients' previous actions. *Developmental Psychology*, *47*(4), 1054–1064. doi:10.1037/a0023869

Kinzler, K. D., Corriveau, K. H., & Harris, P. L. (2010). Children's selective trust in native-accented speakers. *Developmental Science*, *14*(1), 106–111. doi:10.1111/j.1467-7687.2010.00965.x

Koenig, M. A., & Harris, P. L. (2005). Preschoolers mistrust ignorant and inaccurate speakers. *Child Development*, *76*(6), 1261–1277. doi:10.1111/j.1467-8624.2005.00849.x

Kogut, T. (2012). Knowing what I should, doing what I want: From selfishness to inequity aversion in young children's sharing behavior. *Journal of Economic Psychology*, *33*(1), 226–236. doi:10.1016/j.joep.2011.10.003

Leimgruber, K. L., Shaw, A., Santos, L. R., & Olson, K. R. (2012). Young children are more generous when others are aware of their actions. *PLoS ONE, 7(10),* e48292. doi:10.1371/journal.pone.0048292

LoBue, V., Nishida, T., Chiong, C., DeLoache, J. S., & Haidt, J. (2009). When getting something good is bad: Even three-year-olds react to inequality. *Social Development*, *20*(1), 154–170. doi:10.1111/j.1467-9507.2009.00560.x

Lucas, M. M., Wagner, L., & Chow, C. (2008). Fair game: The intuitive economics of resource exchange in four-year olds. *Journal of Social, Evolutionary, and Cultural Psychology*, *2*(3), 74–88. doi:10.1037/h0099353

Olson, K. R., & Spelke, E. S. (2008). Foundations of cooperation in young children. *Cognition*, *108*(1), 222–231. doi:10.1016/j.cognition.2007.12.003

Ongley, S. F., & Malti, T. (2014). The role of moral emotions in the development of children's sharing behavior. *Developmental Psychology*, *50*(4), 1148–1159. doi:10.1037/a0035191

Padoa-Schioppa, C. (2011). Neurobiology of economic choice: A good-based model. *Annual Review of Neuroscience*, *34*(1), 333–359. doi:10.1146/annurev-neuro-061010-113648

Schaefer, D. R., Light, J. M., Fabes, R. A., Hanish, L. D., & Martin, C. L. (2010). Fundamental principles of network formation among preschool children. *Social Networks*, *32*(1), 61–71. doi:10.1016/j.socnet.2009.04.003

Scheres, A., Tontsch, C., Thoeny, A. L., & Sumiya, M. (2014). Temporal reward discounting in children, adolescents, and emerging adults during an experiential task. *Frontiers in Psychology*, *5*, 1–35. doi:10.3389/fpsyg.2014.00711

Schultz, W. (2010). Subjective neuronal coding of reward: temporal value discounting and risk. *European Journal of Neuroscience*, *31*(12), 2124–2135. doi:10.1111/j.1460-9568.2010.07282.x

Sloane, S., Baillargeon, R., & Premack, D. (2012). Do infants have a sense of fairness? *Psychological Science*, *23*(2), 196–204. doi:10.1177/0956797611422072

Sobel, D. M., & Kushnir, T. (2013). Knowledge matters: How children evaluate the reliability of testimony as a process of rational inference. *Psychological Review*, *120*(4), 779–797. doi:10.1037/a0034191

Sommerville, J. A., Schmidt, M. F. H., Yun, J.-E., & Burns, M. (2013). The development of fairness expectations and prosocial behavior in the second year of life. *Infancy*, *18*(1), 40–66. doi:10.1111/j.1532-7078.2012.00129.x

VanderBorght, M., & Jaswal, V. K. (2009). Who knows best? Preschoolers sometimes prefer child informants over adult informants. *Infant and Child Development*, *18*(1), 61–71. doi:10.1002/icd.591

Warneken, F., & Tomasello, M. (2013). The emergence of contingent reciprocity in young children. *Journal of Experimental Child Psychology*, *116*(2), 338–350. doi:10.1016/j.jecp.2013.06.002

Chapter 2: Peer influence on young children's preferences

We care deeply about what others think about us. Our propensity to create and strengthen social connections leads to behaviors that facilitate social bonding and group membership. At the same time, we use others' actions and behaviors as a source of information from which to learn about the world. Even very young children are highly motivated to attend to and learn from the actions of others – but children are not indiscriminate social learners. Instead, they consider factors such as past accuracy (e.g., Birch, Vauthier, & Bloom, 2008; Jaswal & Neely, 2006; Koenig & Harris, 2005) expertise (e.g., Keil, Stein, Webb, Billings, & Rozenblit, 2008), and intention (e.g., Butler & Markman, 2012), when determining from whom to learn. The present research investigated whether one particular type of social information – other's preferences – influences preschoolers' own developing preferences.

The motivation to attend to and learn from the social world might be unique to humans and confer significant adaptive advantages. Learning from others' preferences might be one such adaptive strategy, as children often have to make critical decisions with limited information. Preference expression, via such modes as choice behavior and explicitly stating likes or dislikes, is common behavior that children frequently observe others' performing, and thus could be used to acquire information. This information could be specific to others' idiosyncratic likes and dislikes, but it could also convey information about the generally agreed upon value about the options. If so, children might incorporate information gleaned from observing others' preferences into their own valuation of those options and subsequent preferences.

One particularly well-suited strategy to both acquire culturally transmitted information and strengthen social bonds is to copy a consensus or the majority. There is emerging evidence that, in the absence of prior knowledge, children expect that a majority (3+ individuals) is more

likely to be correct than a minority (van Leeuwen & Haun, 2013). For example, when faced with a group of adults labeling the same object, 3-year-old children tend to side with the majority over a lone dissenter, even developing distrust of the dissenter (Corriveau, Fusaro, & Harris, 2009). Even 2-year-old children are more likely to copy the functional strategy used by a majority of peers in a food-retrieval task than one used by a single peer (Haun, Rekers, & Tomasello, 2012). Thus, in situations where there is at least one objectively correct response, children seem to learn from the statistical prevalence of others' actions and align their behavior with that of the majority.

Preferences, in contrast, are subjective; there is no objectively right or wrong answer to a question such as, "Which is your favorite sticker?" Thus, an intriguing question is whether young children also incorporate the preferences of a majority into their own preferences. On one hand, the subjectivity of preferences might render it socially acceptable to hold and maintain a preference that is different from the majority. On the other hand, subjective information might be more malleable than objective information, and thus social influences might be *stronger* for preference information than objective information. Further, it is plausible that children are more likely to be influenced by other children – their peers – with regard to subjective information. There is evidence that children are able to consider the content of the material, for example, whether they need information about toys or food, when determining whether a child or an adult is a better source of information (VanderBorght & Jaswal, 2009). There is also emerging evidence that children engage in behaviors that strengthen social connections and group membership with peers, such as conformity (Haun & Tomasello, 2011) and reputation management (Engelmann, Herrmann, & Tomasello, 2012; Leimgruber, Shaw, Santos, & Olson, 2012). Thus, in contrast to utilizing adults' general expertise and authority to acquire factual information, children might selectively learn from the preferences of their peers over those of an

adult, especially in circumstances where similarity to their peers, friendship, and potential for future social interactions, might factor into children's learning.

Children frequently encounter situations in which others express their preferences, and appear sensitive to preferences from a young age. By 18 months children understand that preferences are subjective (Graham, Stock, & Henderson, 2006; Repacholi & Gopnik, 1997), and by 3 years recognize when others share their preferences (Fawcett & Markson, 2010). Further, there is emerging evidence that young children use others' preferences to acquire information about the relative value of options. When given the choice between two options, toddlers choose to play with the same objects others have demonstrated a preference for (Fawcett & Markson, 2009), and preschoolers pick toys and activities that were preferred by children over adults and by individuals of the same gender as themselves (Shutts, Banaji, & Spelke, 2009). Preschoolers also avoid options that an adult does not choose, suggesting they devalue those options (Hennefield & Markson, in press). However, it is not yet known if children incorporate information acquired via their peers' preferences into their own valuation of options and subsequent preferences.

One recent study found that young children use their own a priori explicitly stated preferences to guide their option valuations when distributing resources. Blake and Rand (2010) investigated 3- to 6-year-old children's distribution patterns for resources of high- and low-value to the child. Using a Dictator Game (DG) paradigm, children identified their favorite and least-favorite stickers, and were then given either 10 of their favorite or 10 of their least-favorite stickers to distribute between themselves and another child. Children gave fewer of their favorite stickers to the other child, suggesting they assigned a higher value to their favorites stickers and found giving them away to be more costly. In contrast, children gave significantly more of their

least-favorite stickers, indicating a willingness to share provided the cost was not too high.

Resource distribution tasks such as the DG have become increasingly popular in developmental research as a means of investigating fairness and prosocial behavior in young children (Aguilar-Pardo, Martínez-Arias, & Colmenares, 2013; Benenson, Pascoe, & Radmore, 2007; Benozio & Diesendruck, 2015; Blake & Rand, 2010; Chen, Zhu, & Chen, 2013; Gummerum, Hanoch, Keller, Parsons, & Hummel, 2010; Kogut, 2012; Lucas, Wagner, & Chow, 2008; Ongley & Malti, 2014). Though several studies used candy as the resources (Aguilar-Pardo et al.; Kogut), most studies have used stickers, as stickers are thought to be highly valued by children (Benenson et al.). Similar to the distribution patterns reported in the extant adult literature (see Engel, 2011, for a review), one general finding is that children tend to keep 65-75% of the resources for themselves. However, younger children tend to keep more resources than older children (e.g. Benenson et al.), and specifically, younger children keep *all* of the resources more frequently than older children (Blake & Rand; Gummerum et al.; Ongley & Malti). When assessing distribution patterns for children's favorite and least-favorite stickers, Blake and Rand found that a majority of 4-year-old children distributed at least one sticker, and the proportion of favorite and least-favorite stickers those children distributed did not differ from older children. This finding suggests that the DG is a feasible measure for assessing value discrimination in 4-year-old children.

The present study employed the DG to test whether 4-year-old children differentially distribute two different resources – one their peers liked and one their peers disliked. Children watched a video in which 2 boys and 2 girls sequentially demonstrate the same preferences; each liked one specific sticker (liked sticker) and disliked the other (disliked sticker). Then children played two rounds of the DG; one round with 10 liked stickers and one with 10 disliked stickers.

If peers' preferences influence children's own preferences, it was expected that children would keep more liked than disliked stickers. Further, that finding would suggest that children are extracting *informational* content about the value of the stickers from their peers and using that to guide their own preferences. However, if children do not extract informational content from their peers preferences, or it does not influence their own preferences, then children would not be expected to differentially distribute the liked and disliked stickers.

Method

Participants. Seventy-two 4-year-old children participated in either the Experimental (N = 48, M = 4;7, Range = 4;0–5;0, 24 girls) or Baseline Condition (N = 24, M = 4;7, Range = 4;1–5;0, 12 girls). One child was replaced for failing to understand the study instructions. Children were recruited from a database of families who had expressed interest in participating in developmental research, and were tested in a university laboratory. The majority of children were white and from middle-class backgrounds.

Materials. Square stickers, 22mm x 22mm, were printed with one of two blue designs on a white background. The designs, a swirl and snowflake, were chosen to be equally interesting to children, yet distinct (see Figure 2.1). Materials for each child consisted of 20 stickers (10 swirl and 10 snowflake), a felt board with a circle drawn in the middle, four envelopes, and a privacy screen to shield the child from the experimenter during test.

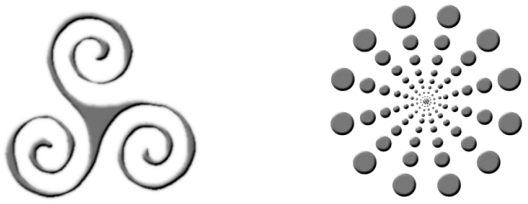

Figure 2.1. The swirl and snowflake designs that were printed in blue ink on the stickers.

Social Influence Manipulation (SIM): Short video clips (each 11.6 s) in which four actors (children from the community, not professional actors) demonstrated that they liked one sticker and disliked another sticker. The actors were two boys and two girls of roughly the same age as the participants. Each actor picked up each sticker in turn and examined it while expressing their preference. They demonstrated *liking* by saying in an excited tone, "Oh, cool, I really like this one!" and *disliking* by saying in a negative tone, "Oh, no, I don't like this one". The "stickers" in the actors' hands were actually blank squares of paper, but children could not tell this from watching the video. As the actor was expressing their first preference, a picture of the sticker they were "looking at" appeared onscreen, to the right of the actor, and remained visible for 4 seconds while they spoke. Then that picture disappeared, a picture of the second sticker appeared onscreen to the left of the actor, and again remained visible for 4 seconds while they expressed the complementary preference. Thus, the same preference expressions (i.e., each instance of a preference being expressed) were counterbalanced to pair with each specific sticker, and all children viewed all of the same preference expressions. This ensured that the actors own preferences could not influence their preference expressions. This method also had the added benefit of equating the length of time allotted to each preference expression in the video. The order in which the actors appeared on screen was counterbalanced with the constraint that two actors of the same gender did not appear in succession.

Procedure. Children in the Experimental Condition watched the SIM and then played the DG; children in the Baseline Condition only played the DG. All children played two rounds of the DG, one round with each sticker design (order counter-balanced). The Baseline Condition was included to test for differences between children who had watched the SIM and those who had not. To begin the DG, the child was seated across a table from the experimenter with the felt

board in front of them. The experimenter placed 10 stickers (10 swirls *or* 10 snowflakes) in a circle on the board, and told the child that all the stickers belonged to the child and they were going to play a game with them. She placed one envelope on the right side of the board and said, "Any stickers you want to keep to take home should go in this envelope". Then she placed another envelope on the left side of the board and said, "Tomorrow there is another girl/boy coming here to play. She/He is just like you. Any stickers you want to leave for her/him should go in this envelope". The gender of the other child was matched to the child's own gender. Then the experimenter pointed to the privacy screen and told the child that when the screen was on the table no one could see which envelopes they put the stickers into. She verified that the child remembered the purpose of each envelope and the screen; if they did not remember she reminded them and asked again. Then she placed the screen on the table between herself and the game board and told the child to "Go ahead and put all the stickers away".

After the child signaled they were done, the experimenter again verified that the child remembered to whom each envelope belonged. One child failed this identification and was replaced. Then the child placed their envelope under their chair for later, placed the envelope for the other child in a large stack of envelopes for anonymity, and played the second round with 10 stickers of the other design. The only difference between the two rounds was that in the second round the child was told that the child they could leave stickers for was different from the child in the first round (e.g., "*another* girl/boy is coming tomorrow"). Finally, in the Experimental Condition, after completing both rounds of the DG, the experimenter placed one sticker of each design in front of the child and asked them to identify which sticker the kids in the video had liked. All children responded correctly.

Results

If children incorporated the preferences expressed by their peers (in the video) into their own preferences, then in the Experimental Condition it was expected that children would keep more liked stickers than disliked stickers. The findings support this hypothesis (see Figure 2.2).

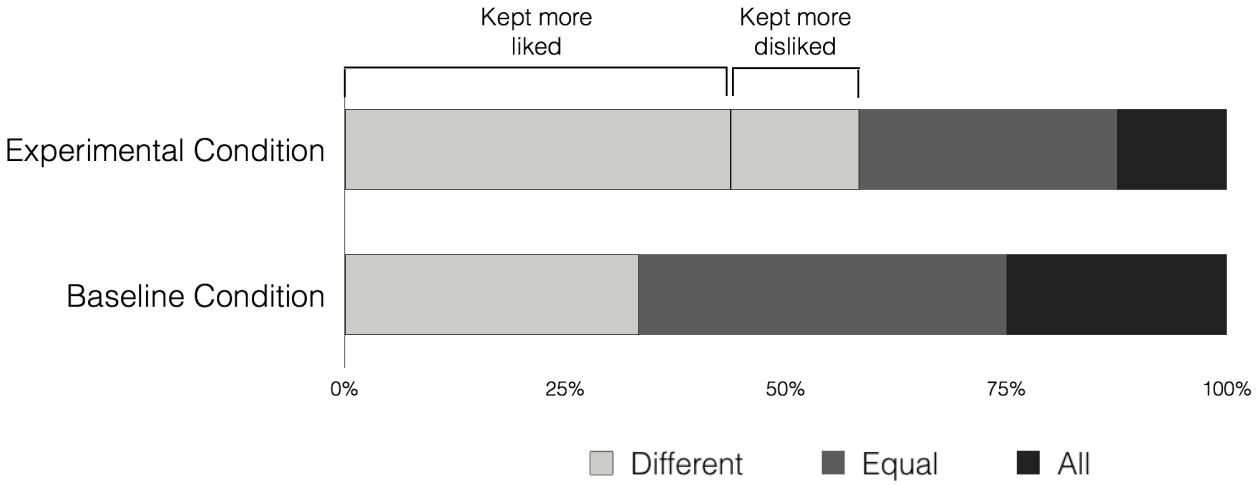

Figure 2.2. This figure shows the proportion of children in the Experimental and Baseline Conditions who kept different quantities of resources, an equal quantity of resources, or all resources between two rounds of the Dictator Game. Marginally more children in the Experimental Condition distributed different quantities of stickers than children in the Baseline Condition. Critically, In the Experimental Condition, significantly more children kept more stickers their peers liked than stickers their peers disliked.

Of the 48 children in the Experimental Condition, 21 children kept more liked than disliked stickers whereas only 7 children kept more disliked than liked stickers. This distribution is significantly different from what would be expected by chance, χ^2 (1, N = 28) = 7, p = .008. In addition, 14 children kept an equal number of liked and disliked stickers, and 6 children kept all of the stickers. If a category for the 14 children who kept an equal number of stickers is added to the above analysis, the distribution remains significantly different from chance, χ^2 (2, N = 42) =

7, $p = .03$. It is unclear how to classify the 6 children who kept all of the stickers. Indeed, some researchers differentiate between prosocial (distributing at least one) and non-prosocial (keeping all) children, and exclude those non-prosocial children from subsequent analyses (e.g., Blake & Rand, 2010; Kogut, 2012). Whereas it is possible that some children are not inclined to give regardless of the value of the resources, it is also possible that these 6 children did *not* differentially value the two stickers, or that keeping all the stickers masked any differentiation they did make. However, even if these 6 children are conservatively added to the 14 children who kept an equal number of stickers, the distribution remains significantly different from chance, χ^2 (2, N = 48) = 7.625, $p = .022$. There were no significant differences or interactions with regard to resource distribution as a function of round order. Overall, these analyses indicate that children were influenced by their peers' preferences such that more children systematically kept more of the stickers their peers liked than those they disliked, and this finding persists even when conservatively including all children (that is, those who did not distribute *any* stickers) in the analyses.

Of the 24 children in the Baseline Condition, only 8 children kept a different number of stickers between the two rounds, 10 children kept an equal number, and 6 children kept all the stickers. Further analyses revealed that children's distribution patterns in the Experimental Condition differed from their distribution patterns in the Baseline Condition. For both conditions, the number of children who kept a *different* quantity of stickers across both rounds was calculated (Experimental = 28; Baseline = 8) and compared to the number of children who kept an *equal* quantity (or all) stickers across both rounds (Experimental = 20, Baseline = 16). These distributions are marginally different from each other, Fisher's Exact $p = .079$, which suggests that children in the Experimental Condition who viewed the SIM were more likely to distribute

different quantities of stickers in the two subsequent rounds of the DG than children in the Baseline Condition who had not viewed the SIM. More convincingly, in the Baseline Condition, all 8 children who kept a different quantity of stickers kept more in the second round than the first round. However, in the Experimental Condition, 14 children kept more stickers in the *first* round (67%; 11 were children who distributed the liked-stickers first). That finding suggests that the SIM overrode children's tendencies to keep more stickers as the game progressed.

There were no gender differences in either the Experimental or Baseline Condition, nor were there differences in either condition as a function of sticker type. Interestingly, whereas there is clear evidence that children differentiated between the liked and disliked stickers in their distribution patterns, this difference is only weakly reflected in the mean number of stickers they kept. Children, on average, kept 6.5 liked stickers and 6.1 disliked stickers, t (1) = 1.538, p = .131. In the Baseline Condition children kept an average of 6.75 stickers, which is not significantly different from either the liked or disliked stickers. Further, the modal number of stickers kept in *all* conditions was 5 (31.25% of all distributions), indicating that many children in the present sample possessed a strong desire to distribute resources equally. This preference for equal distribution is commonly found in third party resource distribution tasks where children divide resources between two recipients (e.g., Kenward & Dahl, 2011; Olson & Spelke, 2008), but this preference is often less robust in the DG (e.g., Benenson et al., 2007; Blake & Rand, 2010). Thus, the main finding that more children kept more of the liked than disliked stickers is especially notable because it indicates that peers' preferences play a significant yet subtle role in influencing children's behavior.

General Discussion

The goal of the present research was to investigate whether peers' preferences influence

4-year-old children's own preferences. After viewing four peers express the same preference for one of two stickers, more children subsequently kept more of the stickers their peers liked than the stickers their peers disliked. This pattern was not due to children holding an a priori preference for one of the stickers or an artifact of playing multiple rounds of the dictator game. Thus, the findings indicate that children's resource distribution behavior was significantly affected by the preferences of their peers.

One way in which peers' preferences might influence children's own preferences is by affecting the underlying value children assign to the options. Value, for the present purposes, is defined as the relative importance, usefulness, or worth of an option (e.g., a good or service). There is substantial evidence that, rather than being a fixed attribute, values are computed at the time a choice is made, based on multiple parameters such as characteristics of the option, quantity, temporal availability, and current motivational state of the individual (e.g., Padoa-Schioppa, 2011). Thus, it is plausible that children in the present study used their peers' preferences to increase their relative valuation of the liked sticker and/or decrease their relative valuation of the disliked sticker. In this account, children's valuations for the options were influenced by their peers' preferences, and children subsequently used these value judgments to inform their own preferences.

If children's option valuations were influenced by their peers that raises several questions for further consideration. The first question concerns whether children increased their relative valuation of the option their peers liked, decreased their valuation of the option their peers disliked, or both. The DG could have potentially offered insight into this question if children's distribution patterns for the liked or disliked stickers differed significantly from either the Baseline Condition or norms typically reported in the literature. However, given that the

differences in children's distribution patterns were only weakly reflected in the mean number of stickers they kept, it is not clear that the patterns observed in the present study fully captured children's value discrimination. Potential distinctions between liked and disliked information are important, however, because there is considerable evidence that both adults and children use positive and negative information in substantially different ways to reason about the world. In particular, this difference manifests in a negativity bias in which negative information is learned and used to a greater degree than positive information (see Vaish, Grossmann, & Woodward, 2008, for a review). Thus, if the negativity bias extends to preference information, it would be expected that children would devalue the option their peers disliked to a greater extent than they increase their valuation of the option their peers liked. However, if children consider subjective assessments of the options to be accurate and reliable indicators of the value of the options, they might both devalue options others disliked *and* increase their valuation for options others liked. Further, the *contrast* between the two types of preference expressions might serve to highlight differences between the two options and facilitate or compound value differentiation.

A second question concerns the consistency and quantity of the information children might need in order to acquire value information from observing others' preferences. In the present study, the information children received about their peers' preferences was consistent across four peers. There is substantial evidence that young children are able to use statistical information to inform their learning, and this extends to using statistical information to infer others' preferences (Kushnir, Xu, & Wellman, 2010; Ma & Xu, 2011). However, whether children attended to the internal consistency of the preference information (i.e., within-individual consistency) or the proportion of individuals who expressed a particular preference (i.e., between-individual consistency) is not known. Further, classic work on social influence and

conformity has found a minimum of three informants necessary to elicit conformist behavior in adults (e.g., Asch, 1956). Four informants were used in the present study to equate gender, however it is unclear whether children *needed* to view four different peers in order to be influenced by their preferences. One possibility is that, because the peers were strangers, children might have attended to the quantity and consistency of the preferences to a greater degree than they would if the peers were familiar and known to the child. Future studies are needed to clarify the impact of informant attributes on children's option valuations and preferences.

Alternatively, children's responses in the present study could have been driven by the social dynamics of the experimental context. Peers' preferences might influence children's understanding of what *other* children value, and children could have used this information to infer how they *should* respond. There is some evidence that 4-year-old children will publically conform to their peers, even when they know their peers are wrong (Haun & Tomasello, 2011), and that 5-year-old children strategically manage their reputations, sharing more with recipients who could reciprocate later, and when being observed by ingroup over outgroup members (Engelmann, Over, Herrmann, & Tomasello, 2013). Thus, it is possible that children used the most salient information afforded to them in this experiment, the SIM, to figure out how to most appropriately distribute the resources. It is also possible that children considered the disliked stickers to undesirable, and thus considered *not* giving them away to be prosocial behavior. Whereas the present study cannot definitively rule out these possibilities, neither explanation would predict the specific distribution pattern that was found. If children's responses were solely or primarily guided by reputational concerns, then differences in children's distribution of the liked and disliked stickers most likely would have been *more* pronounced than they were. Further, if children believed the disliked stickers to be truly undesirable to others, then children

might have been expected to have kept *more* disliked than liked stickers, as they would not benefit from giving the disliked stickers away. Thus, whereas children might have *considered* their reputation and preferences of the recipient when determining how many resources to distribute, it is unlikely those factors fully account for the pattern of results obtained in this study.

There is a wealth of timely and pertinent information available via the social domain, and strategically extracting and utilizing such information could yield adaptive advantages. The present research indicates that young children can use social information – specifically, peers' preferences – to inform their relative valuation of options and subsequent preferences. Research on children's learning in social contexts has primarily focused on the factual information that children learn from adults (e.g., Sobel & Kushnir, 2013). However, peers comprise an essential component of children's social networks, and understanding the contexts and type of information that children might learn from their peers is crucial to a comprehensive understanding of social cognitive development. This study offers a first look at the influence of peers on young children's developing preferences, and the findings suggest that, indeed, children do consider their peers' preferences to provide value-laden information. Further, whereas peers' preferences might denote the generally agreed upon value of the options, it is also possible that their preferences inform children of culture-specific valuations. Thus, acquiring information about the value of options via social contexts might also serve to facilitate the cultural transmission of information and strengthen social connections.

References

Aguilar-Pardo, D., Martínez-Arias, R., & Colmenares, F. (2013). The role of inhibition in young children's altruistic behaviour. *Cognitive Processing*, *14*(3), 301–307. doi:10.1007/s10339-013-0552-6

Asch, S. E. (1956). A minority of one against a unanimous majority. *Psychological Monographs General and Applied*, *70*(9), 1–70.

Benenson, J. F., Pascoe, J., & Radmore, N. (2007). Children's altruistic behavior in the dictator game. *Evolution and Human Behavior*, *28*(3), 168–175. doi:10.1016/j.evolhumbehav.2006.10.003

Benozio, A., & Diesendruck, G. (2015). Parochialism in preschool boys' resource allocation. *Evolution and Human Behavior*, 1–9. doi:10.1016/j.evolhumbehav.2014.12.002

Birch, S. A. J., Vauthier, S. A., & Bloom, P. (2008). Three- and four-year-olds spontaneously use others' past performance to guide their learning. *Cognition*, *107*(3), 1018–1034. doi:10.1016/j.cognition.2007.12.008

Blake, P. R., & Rand, D. G. (2010). Currency value moderates equity preference among young children. *Evolution and Human Behavior*, 1–11. doi:10.1016/j.evolhumbehav.2009.06.012

Butler, L. P., & Markman, E. M. (2012). Preschoolers use intentional and pedagogical cues to guide inductive inferences and exploration. *Child Development*, *83*(4), 1416–1428. doi:10.1111/j.1467-8624.2012.01775.x

Chen, Y., Zhu, L., & Chen, Z. (2013). Family income affects children's altruistic behavior in the dictator game. *PLoS ONE*, *8*(11), 1–8. doi:10.1371/journal.pone.0080419

Corriveau, K. H., Fusaro, M., & Harris, P. L. (2009). Going with the flow: Preschoolers prefer nondissenters as informants. *Psychological Science*, *20*(3), 372–377. doi:10.1111/j.1467-9280.2009.02291.x

Engel, C. (2011). Dictator games: A meta study. *Experimental Economics*, *14*(4), 583–610. doi:10.1007/s10683-011-9283-7

Engelmann, J. M., Herrmann, E., & Tomasello, M. (2012). Five-year olds, but not chimpanzees, attempt to manage their reputations. *PLoS One, 7(10)*, e48433. doi:10.1371/journal.pone.0048433

Engelmann, J. M., Over, H., Herrmann, E., & Tomasello, M. (2013). Young children care more about their reputation with ingroup members and potential reciprocators. *Developmental Science*, *16*(6), 952–958. doi:10.1111/desc.12086

Fawcett, C.A., & Markson, L. (2009). Infants place equal value on preference information from familiar or unfamiliar individuals. Poster presented at the Society for Research in Child Development, Denver, CO.

Fawcett, C. A., & Markson, L. (2010). Children reason about shared preferences. *Developmental Psychology*, *46*(2), 299–309. doi:10.1037/a0018539

Graham, S. A., Stock, H., & Henderson, A. M. E. (2006). Nineteen-month-olds' understanding of the conventionality of object labels versus desires. *Infancy*, *9*(3), 341–350. doi:10.1207/s15327078in0903_5

Gummerum, M., Hanoch, Y., Keller, M., Parsons, K., & Hummel, A. (2010). Preschoolers' allocations in the dictator game: The role of moral emotions. *Journal of Economic Psychology*, *31*(1), 25–34. doi:10.1016/j.joep.2009.09.002

Haun, D. B. M., & Tomasello, M. (2011). Conformity to peer pressure in preschool children. *Child Development*, *82*(6), 1759–1767. doi:10.1111/j.1467-8624.2011.01666.x

Haun, D. B. M., Rekers, Y., & Tomasello, M. (2012). Majority-biased transmission in chimpanzees and human children, but not orangutans. *Current Biology*, *22*(8), 727–731. doi:10.1016/j.cub.2012.03.006

Hennefield, L. & Markson, L. (in press). In you don't want it neither do I: Social influences on children's choices. *Journal of Experimental Child Psychology.*

Jaswal, V. K., & Neely, L. A. (2006). Adults don't always know best: Preschoolers use past reliability over age when learning new words. *Psychological Science*, *17*(9), 757–758. doi:10.1111/j.1467-9280.2006.01778.x

Keil, F., Stein, C., Webb, L., Billings, V. D., & Rozenblit, L. (2008). Discerning the division of cognitive labor: An emerging understanding of how knowledge is clustered in other minds. *Cognitive Science*, *32*(2), 259–300. doi:10.1080/03640210701863339

Kenward, B., & Dahl, M. (2011). Preschoolers distribute scarce resources according to the moral valence of recipients' previous actions. *Developmental Psychology*, *47*(4), 1054–1064. doi:10.1037/a0023869

Koenig, M. A., & Harris, P. L. (2005). Preschoolers mistrust ignorant and inaccurate speakers. *Child Development*, *76*(6), 1261–1277. doi:10.1111/j.1467-8624.2005.00849.x

Kogut, T. (2012). Knowing what I should, doing what I want: From selfishness to inequity aversion in young children's sharing behavior. *Journal of Economic Psychology*, *33*(1), 226–236. doi:10.1016/j.joep.2011.10.003

Kushnir, T., Xu, F., & Wellman, H. M. (2010). Young children use statistical sampling to infer the preferences of other people. *Psychological Science*, *21*(8), 1134–1140. doi:10.1177/0956797610376652

Leimgruber, K. L., Shaw, A., Santos, L. R., & Olson, K. R. (2012). Young children are more generous when others are aware of their actions. *PLoS ONE, 7(10),* e48292. doi:10.1371/journal.pone.0048292

Lucas, M. M., Wagner, L., & Chow, C. (2008). Fair game: The intuitive economics of resource exchange in four-year olds. *Journal of Social, Evolutionary, and Cultural Psychology*, *2*(3), 74–88. doi:10.1037/h0099353

Ma, L., & Xu, F. (2011). Young children's use of statistical sampling evidence to infer the subjectivity of preferences. *Cognition*, *120*(3), 403–411. doi:10.1016/j.cognition.2011.02.003

Olson, K. R., & Spelke, E. S. (2008). Foundations of cooperation in young children. *Cognition*, *108*(1), 222–231. doi:10.1016/j.cognition.2007.12.003

Ongley, S. F., & Malti, T. (2014). The role of moral emotions in the development of children's sharing behavior. *Developmental Psychology*, *50*(4), 1148–1159. doi:10.1037/a0035191

Padoa-Schioppa, C. (2011). Neurobiology of economic choice: A good-based model. *Annual Review of Neuroscience*, *34*(1), 333–359. doi:10.1146/annurev-neuro-061010-113648

Repacholi, B. M., & Gopnik, A. (1997). Early reasoning about desires: evidence from 14- and 18-month-olds. *Developmental Psychology*, *33*(1), 12–21.

Shutts, K., Banaji, M. R., & Spelke, E. S. (2009). Social categories guide young children's preferences for novel objects. *Developmental Science*, *13*(4), 599–610. doi:10.1111/j.1467-7687.2009.00913.x

Sobel, D. M., & Kushnir, T. (2013). Knowledge matters: How children evaluate the reliability of testimony as a process of rational inference. *Psychological Review*, *120*(4), 779–797. doi:10.1037/a0034191

Vaish, A., Grossmann, T., & Woodward, A. (2008). Not all emotions are created equal: The negativity bias in social-emotional development. *Psychological Bulletin*, *134*(3), 383–403. doi:10.1037/0033-2909.134.3.383

van Leeuwen, E. J. C., & Haun, D. B. M. (2013). Conformity in nonhuman primates: fad or fact? *Evolution and Human Behavior*, *34*(1), 1–7. doi:10.1016/j.evolhumbehav.2012.07.005

VanderBorght, M., & Jaswal, V. K. (2009). Who knows best? Preschoolers sometimes prefer child informants over adult informants. *Infant and Child Development*, *18*(1), 61–71. doi:10.1002/icd.591

Chapter 3: The influence of peers on 3-year-old children's object valuations

Children frequently need to choose between options for which they know very little about – for example, deciding which toy to play with or which food to eat. Other individuals often have to make those very same decisions. Thus, observing *others'* preferences might be a particularly adaptive strategy for acquiring information about those options. This information could be specific to others' idiosyncratic likes and dislikes, but it could also convey information about the generally agreed upon value of the options. If so, children might incorporate information gleaned from observing others' preference into their own subjective valuation of those options.

Value, for the present purpose, is defined as the relative importance, usefulness, or worth of an option (e.g., a good or service). Value discrimination is a comparison of two or more options that vary on multiple dimensions; economic choice is the decision that results from such comparison. Thus, values, as such, are computed at the time a choice is made, based on multiple dimensions, including attributes of the option, quantity, temporal availability, and current motivational state (e.g., Padoa-Schioppa, 2011). The primary goal for the present research was to assess whether one particular type of social information – the preferences of other children – factors into the relative subjective value that children assign to options.

We focused on the preferences of children for two reasons. First, there is substantial evidence that children are not indiscriminate learners – they consider factors such as past reliability (e.g., Birch, Vauthier, & Bloom, 2008; Jaswal & Neely, 2006; Koenig & Harris, 2005), expertise (e.g., Keil, Stein, Webb, Billings, & Rozenblit, 2008), consensus with a majority (Corriveau, Fusaro, & Harris, 2009), and even group membership (Kinzler, Corriveau, & Harris, 2010), in determining from whom to learn. Further, children are also able to consider the content of the material, for example, whether they need information about toys or food, when

determining whether a child or an adult is a better source of information (VanderBorght & Jaswal, 2009). Thus, children might selectively learn from the object preferences of their peers over those of an adult. Second, peers are critical to the fabric of young children's social environment. Preschool children form complex social networks, which include strong reciprocal friendships with a limited number of peers, relationships with friends of friends, and hierarchies of popularity (Schaefer, Light, Fabes, Hanish, & Martin, 2010). There is also emerging evidence that children engage in behaviors that strengthen social connections and group membership, such as conformity (Haun & Tomasello, 2011) and reputation management (Engelmann, Herrmann, & Tomasello, 2012; Leimgruber, Shaw, Santos, & Olson, 2012; Engelmann, Over, Herrmann, & Tomasello, 2013). Research on children's learning in social contexts has primarily focused on factual information that children learn from adults (e.g., Sobel & Kushnir, 2013). However, as peers comprise an essential component of children's social networks, understanding the contexts and type of information that children might learn from peers is crucial to a comprehensive understanding of social cognitive development. The present research aims to address this gap and provide insight into one context, preference, in which children might learn from their peers.

The goal of this introduction is to provide an overview of two disparate literatures: children's economic understanding and social influence on children's preferences. Recent research demonstrates that 4-year-old children can use their own a priori explicitly stated preferences to guide their option valuations when distributing resources between themselves and another child (Blake & Rand, 2010). The present work introduces two resources distribution tasks adapted from the fairness and prosociality literature to assess value discrimination in 3-year-old children. In the first of three studies, we assessed whether children differentially distribute two resources (stickers) based on an a priori preference for one of the resources.

Specifically, we tested whether children would use resource value to systematically reward a prosocial agent and/or punish a non-prosocial agent (Study 1). Using the resource distribution methodology devised for Study 1, we then investigated whether children utilize information garnered from their peers' preferences (e.g., their likes and dislikes) to inform their valuations of the resources (Study 2). Finally, I contrasted the indirect value assessment methodology from Studies 1 and 2 with a more direct approach, and also tested whether children's own preferences were influenced by their peers' preferences (Study 3). Together, these studies provide new insight into children's early economic reasoning, and highlight key ways in which social information influences children's developing valuations.

Children's Economic Understanding

Historically, economic understanding has been thought to arise rather late in development, as children do not appear to have a firm grasp of concepts such as money, supply and demand, and price until the late elementary school or adolescent years (e.g., Berti & Bombi, 1981; Siegler & Thompson, 1998). In one early study, Burris (1983) conducted interviews with 4- to 12-year-old-children in which they were presented with pairs of objects and asked which would cost more. Four- to 5-year-old children tended to base their evaluations on physical characteristics, such as asserting that a diamond does not cost much "because it's so tiny". Seven-year-old children often gave responses that included a functional component, such as a wristwatch costs more than a book "because you can tell time on a watch, but a book you can just read". By 11-years of age, children frequently responded by offering accounts of production, such as shoes costing more than candy because "candy is easier to make, but a pair of shoes takes a pretty long time". Another study found that most 9-year-old children understood components of economic exchange to include profit seeking, acquiring goods inexpensively, and

outcompeting other sellers, whereas 5-year-old children did not (Thompson & Siegler, 2000). Notably, a majority of this early research focused heavily on children's understanding of adults' concepts of economics, rather than components that might underlie intuitive economic understanding.

Intuitive economics refers to the representations and mechanisms underlying core knowledge of economic value and exchange (Lucas, Wagner, & Chow, 2008). Whereas significant attention has been given to infants and young children's intuitions regarding areas such as physics (e.g., Baillargeon, 2004; Spelke, Breinlinger, Macomber, & Jacobson, 1992), agency (e.g., Gergely, Nádasdy, Csibra, & Bíró, 1995; Woodward, 1998), and number (e.g., Feigenson, Dehaene, & Spelke, 2004; Sarnecka & Carey, 2008), little research has explored questions regarding intuitive economics. Whether the same concepts and mechanisms that underlie intuitive economics are used later in development to inform adults' economic understanding has also not been explored. However, it is likely that at least one fundamental component of economic understanding, that of economic valuation, is both present early, and maintains a central role in economic understanding throughout development.

There are several simple heuristics that infants might use to assign differential value to options prior to acquiring, or in addition to utilizing, more complex strategies. One such heuristic is a quantitative "more-is-more" heuristic in which a larger quantity of a given item is considered more valuable than a smaller quantity of that same item. In a study designed to investigate numerical representation, Feigenson, Carey, and Hauser (2002) tested 10 and 12-month-old infants choices between different quantities of the same item. Infants viewed different quantities of crackers (e.g., 1-vs-2, 2-vs-3, 3-vs-6) being placed in opaque containers and were then encouraged to choose one container. Infants reliably chose the container with the largest quantity

in the 1-vs-2 and 2-vs-3 conditions, suggesting that infants are able to represent these smaller quantities and make value judgments about them. In a follow-up condition, infants were presented with one huge cracker vs two much smaller crackers, and one large cracker vs two smaller crackers that together equaled the size of the larger cracker. In the former, infants chose the huge cracker over the two small crackers – opting for the container with the largest overall mass of cracker, and in the latter infants chose equally between the options. These findings offer preliminary evidence that infants engage in economic valuation. Further, infants do not appear to employ a straightforward numerical "more-is-more" heuristic when comparing discrete quantities of items, but rather evaluate the total mass of the items they are choosing between when deciding which option is greater in quantity.

The extant literature on fairness and prosociality in early childhood also offers evidence that infants and young children engage in economic valuation. Economic valuation is crucial for understanding fairness and reciprocity. Without knowing the value of a resource, one is limited in they ways they are able to assess whether resources were distributed fairly or whether someone has adequately reciprocated a favor, and infants appear to have some understanding of both of those concepts from an early age. Sommerville and colleagues (Sommerville, Schmidt, Yun, & Burns, 2013) investigated whether infants have a functional understanding of fairness via equal distribution of objects in third-party tasks. The researchers found that 15-month-old infants looked longer, potentially indicating surprise, when resources were distributed unequally between two adults compared to when they were distributed equally. Similarly, Sloane, Baillargeon, and Premack (2012) demonstrated that 19-month-old infants seemed to expect an experimenter to allocate two items equally between two individuals, but not between two inanimate objects. Further, by 3 years of age children get upset when they receive less of a

resource than someone else and will attempt to correct the situation (LoBue, Nishida, Chiong, DeLoache, & Haidt, 2009). These findings indicate that infants and young children expect and desire resources to be distributed equally between recipients.

Several recent studies have also investigated young children's resource distribution in contexts in which children might *not* consider distributions of equal quantities to be fair. For example, Kenward and Dahl (2011) found that 4.5-year-old children gave more biscuits to a puppet who helped an agent than to one who hindered that agent. The preschoolers justified their actions with statements about the prosocial and antisocial behaviors of each puppet, suggesting they chose to reward the prosocial puppet with more biscuits and/or punish the antisocial puppet with fewer biscuits. Kanngiesser and Warneken (2012) had children work with a puppet to complete a task, and contrasted conditions in which either the puppet worked harder, or the child worked harder. In a subsequent distribution task, both 3- and 5-year-old children kept more stickers for themselves when they worked harder, and shared more when the puppet worked harder. This finding provides additional support for the claim that children viewed the resources as having value and used this value to reward the puppet in the condition where the puppet worked harder. In a similar merit-based task, Baumard, Mascaro, and Chevallier (2012) found that 3- and 4-year-old children opted to give a bigger cookie to an agent who worked harder to bake the cookies and a smaller cookie to an agent who did not work as hard. Here, the researchers operated under the assumption that children would find the bigger cookie to be of higher value, and concluded that children used the larger cookie to reward the agent who worked harder. Regarding reciprocity, 3-year-old children prefer to share resources with people who have shared with them (direct reciprocity) and people who have shared with others (indirect reciprocity; Olson & Spelke, 2008). Together, these findings support the hypothesis that young

children engage in intuitive economic valuation. They appear to understand that the total value of a larger quantity of a given resource is different from a smaller quantity of that same resource, and that resource value can be used to reward prosocial behaviors such as sharing and hard work.

Finally, in an extensive cross-cultural study on children's fairness in resource distribution, Rochat et al. (2009) examined how children from seven different cultures shared small collections of items. Some collections contained all the same basic items and some collections included "special" items thought to be highly desirable to children (e.g., bigger and more brightly colored candies and stickers), and thus of higher value. Whereas there was some cultural variation, researchers found that across all samples, 3-year-old children tended to keep a larger quantity of items for themselves than they gave to others, and also kept more of the highly valued items for themselves. Further, when asked to divide the items into two collections, and told that the experimenter would select a collection first leaving the child with the non-selected collection, children overwhelmingly divided the items equally between the collections. Together, these finding provide additional evidence that young children assign value options, they can use value to create equal or unequal distributions depending on the context, they prefer higher-valued options for themselves, and that, cross-culturally, children use quantity – number and size – in their value assessments.

Whereas heuristics might play an important role in infants' early economic valuation, and possibly offer stable evolutionary strategies (e.g., van Leeuwen & Haun, 2013), simple computations are not likely adequate to explain complex economic valuations. Thus, it is also crucial to consider how additional information, such as context, might be incorporated into value judgments. For example, the manner in which a choice is framed (Tversky & Kahnemann, 1981) and the options that the choice is being evaluated against (Hsee, 1998) are two factors that

influence the values adults assign to options. Thus, it is clear that value is not a set property affixed to specific options, but rather operates in relation to other options in the broader context in which one is making such an evaluation. As the social environment is a salient component of context, it is likely that individuals would use information provided from the social environment to inform their valuations. Social information might be employed via heuristics (e.g., broadly applying strategies such as "copy-the-majority"), or via a more thorough consideration of the social context (e.g., considering the type of information, attributes of the source providing the information, etc.). The possibility that children use social information to inform their developing preferences will be considered in detail in the following section.

Social Influences on Children's Preferences

The motivation to attend to and learn from the social world might be unique to humans and confer significant adaptive advantages. Learning from others' preferences might be one such adaptive strategy, as children often have to make critical decisions with limited information. Preference expression, via such modes as choice behavior and explicitly stating likes or dislikes, is common behavior that children frequently observe others' performing, and could thus be used to acquire information. This information could be specific to others' idiosyncratic likes and dislikes, but it could also convey information about the generally agreed upon value of the options. If so, children might incorporate information gleaned from observing others' preferences into their own valuation of those options.

There are several requisite skills children must possess to acquire value information via observation of other's preferences. First, children must be motivated to seek out and attend to information from the social world. Without motivation to learn from the social world, there is no reason to posit that children would garner information from other's behavior and preferences.

Second, children must accurately understand others' choices or evaluations (e.g., stating that they like an option) to reflect their underlying preferences. They need to understand and recognize preferences as such to infer that someone is expressing reliable and meaningful information, rather than exhibiting random or unintentional behavior.

Young children are highly motivated to attend to the behaviors and actions of others (e.g., Herrmann, Hernandez-Lloreda, Call, Hare, & Tomasello, 2010). Sensitivity to communicative cues, and motivation to learn from others, are hallmarks of human cognition (Csibra & Gergely, 2009; Herrmann et al.). Numerous studies have demonstrated the ease with which children use social cues to learn words (e.g., Baldwin et al., 1996), determine which objects in their environment to explore (e.g., Mumme, Fernald, & Herrera, 1996), and choose who to interact with (e.g., Feinman & Lewis, 1983). These social cues generally consist of eye gaze, pointing, and emotional utterances. Importantly, young children initiate these social exchanges spontaneously and across a myriad of contexts, which is indicative of their motivation to learn from the world around them. Tomasello and colleagues (Tomasello, Carpenter, Call, Behne, & Moll, 2005) have even argued that this motivation to attend to, share with, and understand the intentions of others comprise an essential component of children's social reasoning and learning.

A multitude of findings in the extant literature highlight young children's sensitivity to preferences. Eighteen-month-old infants understand that other's preferences are subjective and can differ from their own (Repacholi & Gopnik, 1997). Nineteen-month-old infants understand that preferences differ across individuals, expecting that individuals should use the same names for things but do not necessarily share the same preference for those things (Graham, Stock, & Henderson, 2006). Toddlers also use adults' non-random sampling (i.e., intentional choice) behavior as a cue for their preference (Kushnir, Xu, & Wellman, 2010), even when that

preference is different from the toddlers' own preference (Ma & Xu, 2011). Further, 2-year-old children recognize when others share their preferences (Fawcett & Markson, 2010a), and 3-year-old children prefer to play with children who share their preferences (Fawcett & Markson, 2010b). Three-year-old children also choose toys and activities that were preferred by other children over adults, and by individuals of the same gender as themselves (Shutts, Banaji, & Spelke, 2009). In addition, Hennefield and Markson (in press) demonstrated that 4-year-old children were influenced by an adults' preference behavior only when given clear evidence that the adult made an informed decision, rather than a blind choice between two options. Together, these studies demonstrate that young children understand that others' can hold a preference that is different from their own, and can use statistical information and choice behavior to infer others' preferences.

There is also recent evidence to suggest children can incorporate information obtained via others preferences into their own object choices. In one study, 18-month-old infants chose to play with the same objects for which adults had demonstrated a preference (Fawcett & Markson, 2009). Another study found that when 4-year-old children observed an adult choose between two objects, children attended to the object that was *not* chosen, and avoided selecting that object for themselves. This suggests children devalue options others do not select (Hennefield & Markson, in press). Together, these findings provide initial support for the hypothesis that children use other's preferences to inform their option valuations.

If preferences convey value information, important questions arise concerning the nature of that information. The present work will focus on the contrasts between options that have been *liked* relative to another option, *disliked* relative to another option, and *neutral* – i.e., no preference information expressed toward that option. These contrasts are important because it is

plausible that children think about *liking* in a positive manner, and *disliking* in a negative manner, and might consider these two types of information to be substantially different. There is considerable evidence that adults use positive and negative information in different ways to reason about the world. In particular, this difference appears to manifest in a negativity bias in which negative information is learned and used to a greater degree than positive information. More recent research has extended these broad findings to children, with a majority of research focusing on a negativity bias in the context of social referencing (see Vaish, Grossmann, & Woodward, 2008, for a review). For example, Mumme et al. (1996) had mothers provide infants with positive (happy), neutral, or negative (fearful) emotional information about ambiguous toys. Infants were subsequently less likely to explore toys their mother was fearful toward than toys she was happy or neutral toward. Because there was no difference in infants' explorations of the happy and neutral toys, that suggests that negative information was treated differently from the other information.

It is important to consider the potential impact of a negativity bias on option valuation, because it might be the case that children attend to or incorporate information differently depending on the valence of that information. There are clear evolutionary advantages for a bias to avoid options that others have shown fear or disgust toward, as people tend to show those negative expressions towards things that are potentially harmful or lethal. In contrast, because preferences are subjective, they might not invoke the same vigilance and avoidance reactions that typically characterize the negativity bias. Thus, children might devalue options others disliked *and* increase their valuation for options others liked if they consider others' subjective assessments of the options to be accurate and reliable indicators of the valuation of the options. Crucially, in the absence of other information, all preferences have the *potential* to provide value

information about options and might guide children's own valuations.

In one of the only studies to directly examine children's preexisting preferences on their valuations, Blake and Rand (2010) investigated 3- to 6-year old children's distribution patterns for resources of high and low value to the child. Using a Dictator Game (DG) paradigm, children identified their favorite and least-favorite stickers from a set of four stickers, and then were given either 10 of their favorite or 10 of their least-favorite stickers to distribute between themselves and another child. Children gave fewer of their favorite stickers to the other child (compared to their least-favorite stickers), suggesting they assigned a higher value to their favorites stickers, and found giving them away to be more costly. In contrast, children shared significantly more of their least-favorite stickers, suggesting a willingness to share provided the cost was not too high.

The findings by Blake and Rand (2010) offer support for the current hypothesis that children use resource value to differentially distribute options. However, whereas Blake and Rand found no age differences in the pattern of distribution among those children who distributed at least one sticker, less than 50% of the 3-year-old children they tested distributed at least one sticker across all of their tasks. In contrast, more than 75% of the 6-year-old children they tested distributed at least one sticker. Thus, whereas the DG might be a feasible resource distribution method to use with older children, the lack of variability in younger children's responses makes it problematic to use this task with that age population. Further, in the DG children have to contend with competing desires to keep resources for themselves and behave prosocially by giving resources to the recipient. Whereas these competing demands are a key function of the DG as a method of assessing fairness and prosocial behavior, they are not necessary to assess value discrimination. Indeed, these demands might serve to add substantial noise, rendering the DG ill suited as a measure of value discrimination. Additional factors such

as social norms about sharing and whether the child believes there is the potential for future reciprocity might also factor into children's decisions about how many resources to distribute in the DG.

One goal of the present research was to develop a method for assessing value discrimination that minimizes the aforementioned task demands *and* is appropriate to use with 3-year-old children. To accomplish this, two resource distribution tasks were adapted from the fairness and prosociality literature (e.g., Baumard et al., 2012; Sloane et al., 2012; Olson & Spelke, 2008). In these tasks, children distribute two resources between two agents. These tasks are based on the assumption that children use resource value to reward prosocial agents and/or punish non-prosocial agents. In each task, one agent behaves in a prosocial manner (e.g., gives a gift, cleans up blocks), and is thus potentially deserving of a higher-valued reward. Importantly, this method eliminates children's own acquisition of the resources from their decision-making processes. Further, as children must share one resource with each agent, they do not have to decide whether or how much to share; thus their decision is simplified to deciding which resource to give to which agent. Study 1 directly tests the assumption that children distribute (ostensibly) higher-valued resources to prosocial agents by investigating how 3-year-old children distribute two stickers – their a priori favorite and least-favorite stickers – between a prosocial and non-prosocial agent. Study 2 utilizes the same resource distribution methodology from Study 1 to test whether children differentially distribute, and thus potentially differentially value, stickers they have observed other children like and dislike. Study 3 takes a direct approach, with children explicitly asked to identify which resource they liked best, and which they thought another child would like best. This direct methodology was designed to complement the indirect measures implemented in the first two studies.

Study 1

Study 1 investigated whether preschoolers assign relative and stable values to objects for which they have a priori preferences, and, if so, whether they are able to demonstrate those consistent valuations in multiple contexts. Specifically, we tested whether children would distribute objects of higher value to agents who acted prosocially and were thus more deserving of greater reward. Two independent tasks were developed to test whether 3-year-old children would differentially distribute their favorite of two stickers to: (1) Reciprocity Task – a child who had given the participant a gift, versus a child who did not give them a gift; (2) Merit Task – a child-like puppet who cleaned up all the toys, versus one who did not clean up any toys. Children prefer to share resources with individuals who have previously shared with them (Olson & Spelke, 2008), and expect individuals who worked harder to receive more resources than those who worked less (Baumard et al., 2012; Sloane et al., 2012). Thus, if children assign differential value to the stickers, it was expected that children would distribute their favorite (ostensibly higher-valued) sticker to the prosocial agent in both tasks.

Method

Participants. Twenty-four 3-year-old children (*M* = 3;8, Range = 3;0–3;11, 9 girls) participated in a single testing session. One child was replaced for failing to complete the Reciprocity Task. Children were recruited from a database of families who had expressed interest in participating in developmental research, and were tested in a university laboratory. The majority of children were white and from middle-class backgrounds.

Materials. An initial sticker array consisted of six stickers that were roughly the same size but differed on a variety of characteristics (see Figure 3.1). Some stickers were sparkly or metallic, some were stereotypically gender-oriented (e.g., a basketball and a pink butterfly), and

some were plain and common (e.g., a brown chair). This variety of stickers was chosen to appeal to a range of children's tastes, and also to provide salient properties for children to consider when assessing the stickers.

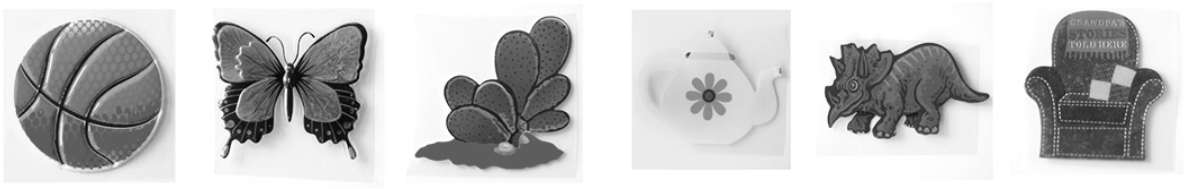

Figure 3.1. The array from which children selected their favorite and least-favorite stickers. The stickers, from left to right, depicted a basketball, butterfly, cactus, teapot, dinosaur, and chair.

Reciprocity Task: Cardboard cubes were stacked together to form six cubbies. Each cubby contained a nametag and several identical small toys. The names on the top two cubbies were changed throughout the study to match the gender of the participant (girl names: Holly/Jane; boy names: Brian/Kyle). A gift box, tied with a ribbon and bow to look like a prototypical present, was placed in one of the top two cubbies (see Figure 3.2). A small chunky crayon was inside the gift box, and made a rattling noise when the box was shaken. The location of the gift box was counterbalanced across participants. Stickers were presented in bags to allow each child the opportunity to choose which sticker to distribute first.

Merit Task: Materials included a puppet-show stage, four puppets (two girl-puppets and two boy-puppets), 13 colorful blocks, and a clear plastic box to contain the blocks. Puppet gender was matched to the gender of the participant, thus each child only saw one pair of puppets. One puppet of each gender was blonde with blue eyes and wore a purple shirt; the other had black hair, brown eyes, and wore a light blue shirt (see Figure 3.3). The different hair, eyes, and shirt colors were chosen to help children easily differentiate the two puppets.

Figure 3.2. A depiction of the cubbies used in the Reciprocity Task. The gift was always placed in one of the top two cubbies, and contrasted with the other top cubby that belonged to a child who did not leave a gift.

Figure 3.3. A depiction of the puppets and set-up used in the Merit Task. One puppet always cleaned up all of the blocks by putting them into the box; the other puppet never cleaned up any blocks.

Design & Procedure. To begin the sticker assessment, the experimenter held up a small bag that contained the stickers, peered inside, and told the child that some of the stickers were really cool and fun and some were boring and not as nice. Then she dumped the stickers out of the bag, turned them all face up, asked, "Which sticker do you like the best?" and encouraged the child to select one. This sticker was set aside and became the "liked" sticker for all subsequent tasks in Study 1. Then the experimenter asked, "Which sticker do you like the least / not as much as the others?" and encouraged the child to select one. This sticker became the "disliked" sticker for the remaining tasks. After selecting the liked and disliked stickers, the experimenter placed those two stickers in front of the child and asked them to again identify their favorite and least-favorite stickers. All children's responses were consistent with their initial preferences.

Reciprocity Task: The child stood on a marker 2' in front of the cubbies. The experimenter stood to the left of the cubbies and told the child that, "These cubbies belong to kids that played here yesterday. This cubby is Jane's [points to cubby with gift] and this cubby is Holly's [points to empty cubby]. We told Jane and Holly that you were coming to play today and Jane left you a present! She left this gift for you [picks up box, shakes it, and shows it to child]. We're playing our game now, but when we're done you can open it up and see what Jane gave you [puts gift out of child's sight, and stands directly behind the child]. Here are two stickers [hands participant a bag containing their most and least-favorite stickers]. You can give one sticker to Jane [points to Jane's cubby] and one sticker to Holly [points to Holly's cubby], and you get to pick who gets each sticker. You can put their stickers in their cubbies. Go ahead." If the child hesitated, the experimenter reminded the child to put one sticker in each top cubby. Responses were coded for which cubby the child placed each sticker in.

Merit Task: The child was seated in front of a puppet-show stage. In the middle of the stage was a clear plastic box, surrounded by colorful blocks. The two puppets were seated behind the blocks. The child was told that, "these boys/girls were playing with these blocks and now it is time for them to clean up and put all the blocks back in the box". Then one of the puppets (the helper) proceeded to put all of the blocks in the box while the other puppet occasionally picked up a block, played with it, and placed it back down on the table. This puppet never put any blocks in the box. Which puppet performed each role, and the side (left/right) where each role was performed, was counterbalanced. There were 13 blocks, and the puppet show lasted approximately 2 minutes and 30 seconds. After the helper put the final block in the box, the experimenter took the box away and said, "All the blocks are cleaned up. Now you have a special job. You get to give one sticker to each of the puppets. You decide who should get each

sticker." Then the experimenter handed the child the bag containing their favorite and least-favorite stickers. The puppets remained stationary until both stickers were distributed. Responses were coded for which sticker children handed (or placed in front of) each puppet.

Memory Verification: After each child completed the Reciprocity Task, the experimenter asked, "Do you remember who left you this gift? Can you point to the cubby it was in?" After the Merit Task, the experimenter asked, "Do you remember which puppet cleaned up all the blocks?" These questions were asked to verify that children, in general, comprehended and remembered the manipulation. Children responded correctly on 94% of the trials, indicating a high level of understanding and memory for the manipulations.

Preference Verification: After both tasks were completed, the experimenter placed the liked and disliked stickers in front of the child and asked, "Which sticker is your favorite?". This question was used to verify that the child's preference did not shift over the course of the study.

Results and Discussion

To test whether children systematically distributed their favorite sticker to the prosocial agents, children's responses were coded for whether they distributed their favorite (1) or least-favorite (0) sticker the prosocial agent in each task. Overall, children gave their favorite sticker to the prosocial agent significantly more often than would be expected by chance ($M = 1.42$, $SD = .65$), $t(1, 23) = 3.122$, $p = .005$ (see Figure 3.4). There were no differences in distribution patterns with regard to task or gender.

In the Reciprocity Task, 17 of 24 children gave their favorite sticker to the agent who left them the gift, binomial probability, $p = .032$. In the Merit Task, 17 of 24 children gave their favorite sticker to the agent who cleaned up all the blocks, binomial probability, $p = .032$. Across both the Reciprocity and Merit Tasks, 12 children gave their favorite sticker to the prosocial

agent in both tasks, 10 children gave their favorite sticker to the prosocial agent in one task, and 2 children never gave their favorite sticker to the prosocial agent. These frequencies are significantly different, χ^2 (2, N = 24) = 7, p = .03.

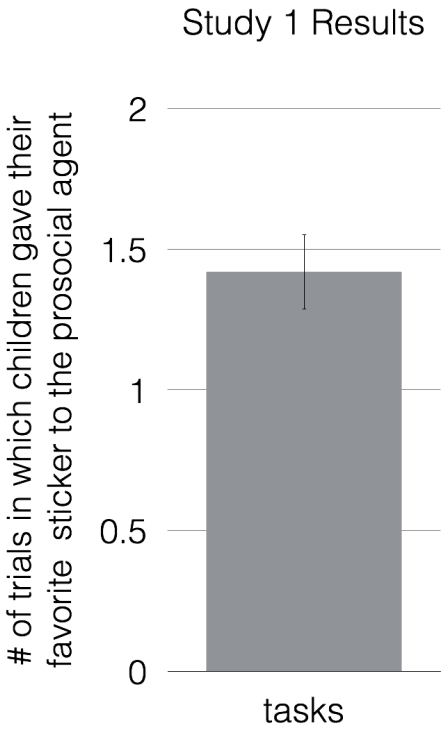

Figure 3.4. In Study 1, children gave their favorite sticker to the prosocial agent more often than would be expected by chance in both the Reciprocity and Merit Tasks.

Two children did not answer the memory question correctly for the Reciprocity question, and one child did not answer the memory question correctly for the Merit question. The purpose of the memory questions was to verify that, in general, children understood and remembered the experimental manipulations. Thus, after verifying that their exclusion did not significantly alter the findings, the children who responded incorrectly were conservatively included in the analyses. Further, one child changed their mind and declared the disliked sticker their favorite

during the final preference verification. It is less clear how to handle this child's data, as it is possible that the child's preferences shifted over the course of the study. However, it is equally possible that they were simply inattentive by the time the question was asked at the conclusion of the study. As no other child changed their mind, it does not appear that changing a preference is something that commonly happens over the course of this study. Thus, after verifying that this child's exclusion did not significantly alter the findings, and this child was included in the analyses.

The goal of Study 1 was to determine whether children assign consistent values to options for which they have a priori preferences. The findings support this hypothesis. Children gave their favorite stickers to the prosocial agents more often than would be expected by chance, indicating they used their a priori preferences, or valuations, to guide their distribution choices. Further, the lack of a difference between performance on the Reciprocity and Merit Tasks suggests that children exhibit these valuations across multiple contexts and situations. Importantly, in these tasks, the basic heuristics discussed earlier were not available (e.g., "more is more" could not be used because quantity was held constant). This study corroborates Blake and Rand's (2010) finding that children's a priori preferences influence their option valuations. Study 2 adapts this methodology to test whether social influences – specifically *other children's preferences* – influence children's option valuation in situations in which they do not hold an a priori preference for one of the options.

Study 2

Study 2 used the value discrimination tasks developed for Study 1 to investigate whether children incorporate information gleaned from observing others' preferences into their valuation of resources. Children watched a video in which four children (2 boys, 2 girls) displayed a

preference for one of two stickers. These peer actors sequentially demonstrated the same preferences; each liked one specific sticker (liked sticker) and disliked the other (disliked sticker). After viewing the video, each child was given two stickers to distribute: *either* the liked sticker and a neutral sticker (Positive Condition) ***or*** the disliked sticker and neutral sticker (Negative Condition) in the Reciprocity and Merit Tasks. If children incorporate preference information into their object valuations, it was predicted that they would give the liked sticker (over the neutral sticker) to the prosocial agents in the Positive Condition, and would give the neutral sticker (over the disliked sticker) to the prosocial agents in the Negative Condition.

Methods

Participants. Forty-eight 3-year-old children (*M* = 3;5, Range = 3;1–3;11, 24 girls) participated in a single testing session. Four children were replaced for parental interference (1), failure to complete the reciprocity task (1), and failure to pass the video familiarization by matching the stickers from the video to physical copies of the stickers (2). Children were recruited from the same population as Study 1, but had not participated in Study 1.

Materials. Three stickers were used. These stickers were 3.8cm diameter circles and consisted of a blue design on a white background. The designs – a star, swirl, and snowflake pattern – were chosen to be equally interesting to children, yet distinct (see Figure 3.5). Whether the swirl or snowflake was the liked or disliked sticker was counterbalanced; the star was always the neutral sticker.

Figure 3.5. The three designs (swirl, star, snowflake) that were printed on circular stickers in blue ink.

Social Influence Manipulation (SIM): Short video clips (each 11.6 s) in which four actors demonstrated that they liked one sticker and disliked another sticker. The third sticker – the neutral sticker – did not appear in the video. The actors were two boys and two girls of roughly the same age as the participants. Each actor picked up each sticker in turn and examined it while expressing their preference. They demonstrated *liking* by saying in an excited tone, "Oh, cool, I really like this one!" and *disliking* by saying in a negative tone, "Oh, no, I don't like this one". The "stickers" in the actors' hands were actually blank squares of paper, but children could not tell this from watching the video. As the actor was expressing their first preference, a picture of the sticker they were "looking at" appeared onscreen, to the right of the actor, and remained visible for 4 seconds while they spoke. Then that picture disappeared, a picture of the second sticker appeared onscreen to the left of the actor, and again remained visible for 4 seconds while they expressed the complementary preference. Thus, the same preference expressions (i.e., each instance of a preference being expressed) were counterbalanced to pair with each specific sticker, and all children viewed all of the same preference expressions. This ensured that the actors own preferences could not influence their preference expression, and this method had the added benefit of equating the length of time allotted to each preference expression in the video. The order the actors appeared on screen was also counterbalanced with the constraint that two actors of the same gender did not appear in succession.

Materials for the Reciprocity and Merit Tasks were the same as those from Study 1.

Design & Procedure. Children were randomly assigned to either the Positive or Negative Condition. The procedure largely followed that of Study 1, with the exception that the SIM replaced children's own sticker assessment. Each child watched the SIM on a laptop computer. After each clip of the actor demonstrating their preference, the experimenter placed

two physical stickers in front of the child. Children in the Positive Condition were presented with the liked sticker (from the video) and the neutral sticker (not in the video) and were asked which sticker the actor liked. Children in the Negative Condition were presented with the disliked sticker and the neutral sticker and were asked which sticker the actor did not like. If a child responded incorrectly, the experiment gently corrected them by saying, "Actually, they said they liked/did not like this one", while pointing to the appropriate sticker.

This type of adult-guided interaction for information presented on video has been shown to facilitate children's abilities to learn via video (Strouse, O'Doherty, & Troseth, 2013). There is ample evidence that toddlers have more difficulty learning information when it is presented via video than when that same information is presented live (e.g.,Troseth, Saylor, & Archer, 2006), and by two and a half years of age that difference is lessened, but does not entirely disappear (Troseth & DeLoache, 1998). However, recent research provides evidence that preschool children learn more efficiently from video when they watch with their parents and their parents periodically pause, ask questions, and have children describe parts of the video (Strouse et al.). Following the experimenter-guided familiarization described above, only two children failed to correctly identify the correct sticker after all four video clips, and were subsequently excluded from analyses and replaced. The remaining children all correctly answered the last two questions, with the majority responding correctly throughout the familiarization.

After watching the SIM, each child completed the Reciprocity and Merit Tasks following the procedure outlined in Study 1. Children in the Positive Condition distributed the liked and neutral stickers, whereas those in the Negative Condition distributed the disliked and neutral stickers.

Results & Discussion

To test whether children systematically distributed the two stickers as a function of the information presented in the SIM, we coded which stickers children gave to the prosocial agents. In the Positive Condition (N = 24), we coded whether children gave the liked (1) or the neutral (0) sticker to the prosocial agents across the two tasks. In the Negative Condition (N = 24), we coded whether children gave the disliked (1) or the neutral (0) sticker to the prosocial agents across the two tasks. If children incorporated the preferences of their peers into their object valuations, then in the Positive Condition children should give more valenced (liked) than neutral stickers to the prosocial agents. In contrast, in the Negative Condition, children should give *fewer* valenced (disliked) than neutral stickers to the prosocial agents. A 2 (Task: Reciprocity/Merit) x 2 (Condition: Positive/Negative) x 2 (Gender: Girls/Boys) Analysis of Variance (ANOVA) was conducted with task as the within-subjects factor and condition and gender as between-subjects factors. The ANOVA revealed no differences between the two tasks, nor an interaction between task and condition; thus, the tasks were collapsed together for the remainder of the analyses. Tests of between-subjects effects revealed a main effect of condition, such that children in the Positive Condition gave significantly more valenced stickers to the prosocial agent (M = 1.17, SD = .76) than children in the Negative Condition (M = .37, SD = .57), $F(1, 44) = 21.011$, $p < .001$. There was also a significant interaction between condition and gender, $F(1, 44) = 13.095$, $p = .001$. The nature of this interaction, and differences between the Positive and Negative Condition, are explored in the following analyses.

In the Positive Condition, an initial analysis indicated that children did not distribute the stickers differentially between the two agents, $t(1, 23) = 1.072$ $p = .295$. However, a one-way ANOVA revealed a main effect of gender such that girls (M = 1.58, SD = .51) distributed *more*

liked stickers to the prosocial agents than boys (M = .75, SD = .75), $F(2, 22) = 10$, p = .005. This finding suggests that girls, but not boys, were sensitive to the information conveyed via their peers' expressions of liking, and used that information to systematically distribute the liked sticker to the more deserving agents.

In the Negative Condition, children gave the *disliked* sticker to the prosocial agents significantly *less* often than would be expected by chance, $t(1, 23) = 5.32$, $p < .001$. A one-way ANOVA revealed a marginal effect of gender such that girls (M = .17, SD = .39) distributed marginally fewer disliked stickers to the prosocial agents than boys (M = .58, SD = .67), $F(2.22) = 3.48$, p = .075 (*see Figure 3.6*). To further clarify the nature of children's distribution patterns in the Negative Condition, we calculated that 16 children never gave the disliked sticker to a prosocial agent, 7 children gave the disliked sticker to a prosocial agent in one task, and 1 child gave the disliked sticker to the prosocial agents in both tasks. These frequencies were significantly different, χ^2 (2, N = 24) = 14.25, $p < .001$. Together, these findings suggest that both girls *and* boys were sensitive to the negative information conveyed via their peers' expressions of dislike, and used that information to systematically *avoid* distributing the disliked sticker to the more deserving agents, instead giving them the neutral sticker. Further, girls used this information to a marginally greater extent than did boys.

For the memory verification questions, children responded correctly on 96% of the trials, indicating a high level of understanding and memory for the manipulations. In the Positive Condition, two children did not correctly answer the Reciprocity verification question; all children correctly answered the Merit verification question. In the Negative Condition, one child did not correctly answer the Reciprocity verification question, and one child did not correctly answer the Merit verification question. After verifying that their exclusion does not significantly

alter the findings, these children were conservatively included in the analyses.

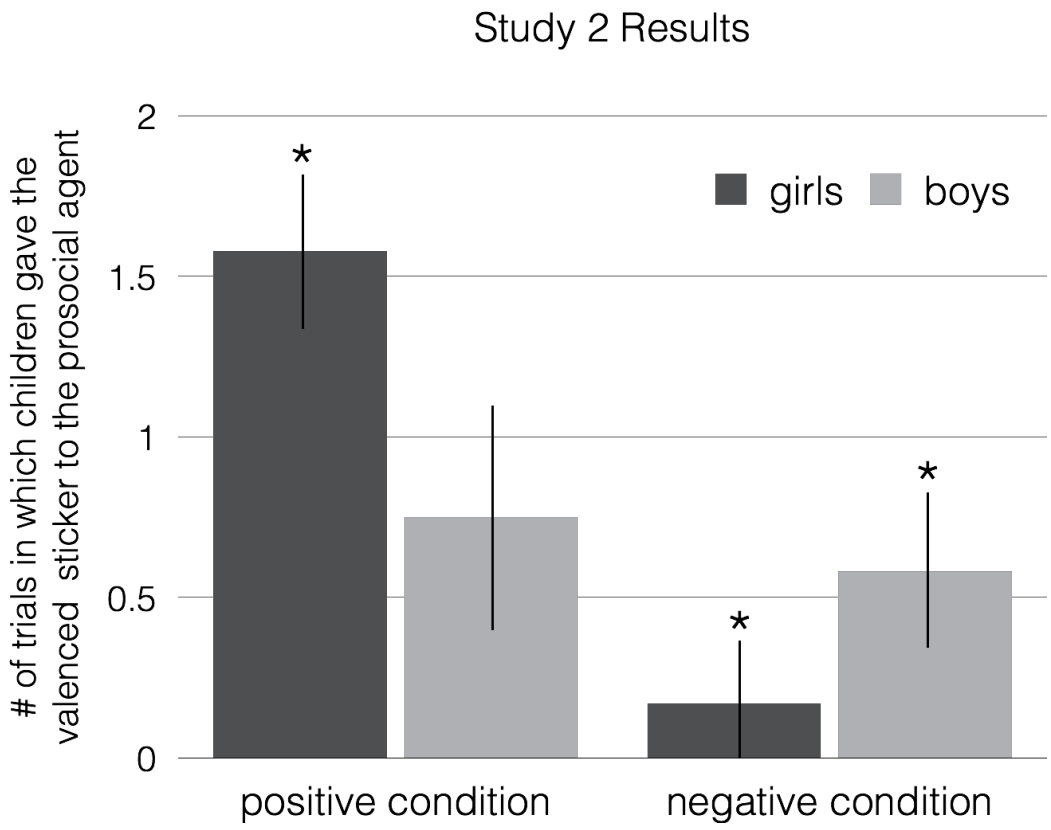

Figure 3.6. In the Positive Condition girls gave the liked sticker to the prosocial agents more often than would be expected by chance. In the Negative Condition both girls and boys gave the disliked sticker to the prosocial agent significantly *less* than would be expected by chance.

After completing the resource distribution tasks, all children were shown the liked and disliked stickers and asked to identify their favorite. In the Positive Condition, 13 children chose the liked sticker as their favorite sticker, and 11 children chose the neutral sticker as their favorite. This distribution is not significantly different from chance, binomial probability p = .419, and there were no gender differences. In the Negative Condition, 6 children chose the disliked sticker as their favorite sticker and 18 children chose the neutral sticker as their favorite.

This distribution is significantly different from chance, binomial probability $p = .011$, and again there were no gender differences. This provides additional evidence that children's valuations of the stickers were influenced largely by their peers dislikes.

Together, these findings suggest that 3-year-old children used information provided by their peers, presented via video, to inform their valuations of options. Children devalued the stickers their peers disliked, as demonstrated by their reluctance to give those stickers to the prosocial agents. Children's devaluation of the disliked stickers was also evidenced in their choice of the neutral sticker over the disliked sticker as their own favorite. However, only girls *increased* their valuation of the liked stickers relative to the neutral stickers, and this valuation was only evidenced in the resource distribution tasks. This gender difference was not predicted, but accords with gender differences found in some other resource distribution tasks (e.g., Blake & Rand, 2010; Dunham, Baron, & Carey, 2011).

There are four plausible explanations for this gender effect. The first is that girls are more sensitive to the social information – other children's preferences – than boys. Thus, either girls remembered the information from the video better, or utilized it more readily, in the distribution tasks. The second explanation is that both boys and girls are equally sensitive to the social information, but girls were more motivated than boys to provide the prosocial agent with the higher-valued option. The third explanation is that girls are more motivated to produce socially desirable responses than boys. The fourth explanation is that the gender of the *agents* drove the gender effect, rather than the gender of the participants. Each of these possibilities will be considered more in depth in the general discussion.

The differences between the Positive and Negative Conditions also suggest that boys, and perhaps girls, considered their peers likes and dislikes as substantially different types of

information. If so, this would provide evidence that the negativity bias extends beyond social-emotional (e.g., Mumme et al., 1996) and highly arousing threatening stimuli (e.g., LoBue, 2014), to subjective preference information. Children's systematic reluctance to choose the disliked sticker as their favorite, but willingness to choose equally between the liked and neutral stickers, provides additional support for the hypothesis that negative information plays a privileged role in influencing children's behavior. However, in Study 2, children were always asked to choose their own favorite sticker *after* completing the two resource distribution tasks. This was done to prevent their explicit choice from potentially influencing their subsequent resource distribution, however, it is also possible that how children distributed the resources influenced their selection of their favorite sticker. Thus, Study 3 was designed to assess children's own preferences directly after viewing the SIM. Further, children were also directly asked which sticker they thought another child would like best, as a contrast to the implicit measure used in Study 2.

Study 3

In Study 3 children viewed the same SIM videos from Study 2, and were shown all three stickers (liked, neutral and disliked) during the experimenter-guided familiarization. Then children were directly asked, in counterbalanced order, which sticker they liked best (Self Question), and which sticker they thought another child would like best (Other Question). In Study 2, children were deliberately not asked to express a preference for one of the stickers until *after* the resource distribution tasks were completed. This was done to avoid facilitating or strengthening children's own preferences for one of the options through their choice behavior. However, as the preference question was asked last in Study 2, it is unclear whether children's responses in that measure might have been affected by first completing the resource distribution

tasks. Thus, Study 3 provides a straightforward test of whether children's own choices were influenced by the SIM. Children were also directly asked which sticker another gender-matched child would like as an additional measure of social influence. Further, in Study 3 children were presented with all three stickers to choose between for each question.

Participants. Twenty-four 3-year-old children (*M* = 3;4, Range = 3;1–4;0, 13 girls) participated in a single testing session. One child was replaced for failure to pass the video familiarization by matching the stickers from the video to physical copies of the stickers. Children were recruited from the same population as Studies 1 and 2, but had not participated in either of those studies.

Materials. The same three stickers and SIM from Study 2 were used, however which specific sticker was the liked, disliked, and neutral sticker was fully counterbalanced. Two photographs, one of a preschool-aged boy and one of a preschool-aged girl, were used for the Other Question.

Design & Procedure. Each child watched the SIM on a laptop computer. To ensure understanding, after the first video clip the experimenter showed each child two physical stickers, the liked and disliked stickers from the video, and asked them which sticker the actor liked and did not like (order randomized). After the remaining three video clips, the experimenter presented each child with all *three* stickers, and asked which sticker the actor liked, disliked, and which was not in the video (order randomized). As in Study 2, if the child responded incorrectly the experimenter gently corrected them. One child failed to correctly identify the correct sticker after all four video clips and was subsequently excluded from analyses and replaced.

After the SIM, the experimenter asked both the Self and Other Questions (order counterbalanced). She asked the Self Question by placing all three stickers in front of the child

and asking, “Now you tell me, which do *you* like the best”. She asked the Other Question by showing a gender-matched child on the laptop, and explaining that this child had never seen these stickers before. Then she placed all three stickers in front of the child and asked, “Now you tell me, which do you think *he/she* would like best?”

Results & Discussion

To test whether children chose the liked stickers (or avoided the disliked stickers) for themselves and a new child, children’s responses were coded for which sticker they first chose (via pointing or picking up) after being asked each question. For the Self Question, of the 24 children, 13 children chose the liked sticker, 8 chose the neutral sticker, and 3 chose the disliked sticker. These frequencies are significantly different, χ^2 (2, N = 24) = 6.25, p = .044. Planned comparisons revealed that children selected the liked sticker more frequently than the disliked sticker, binomial probability, p = .011. However, there were no overall difference between children’s selection of the liked and neutral stickers, or the neutral and disliked stickers. These findings suggest that children systematically avoided selecting the disliked sticker for themselves, yet considered both the liked and the neutral sticker to be equally acceptable candidates to select, and chose equally between them.

For the Other Question, of the same 24 children, 17 children chose the liked sticker as the other child’s favorite, 6 chose the neutral sticker, and 1 chose the disliked sticker. These frequencies are significantly different, χ^2 (2, N = 24) = 16.75, p < .001. Planned comparisons revealed that children selected the liked sticker more frequently than the disliked sticker, binomial probability, p < .001, and the neutral sticker marginally more frequently than the disliked sticker, binomial probability p = .062. Children also selected the liked sticker more frequently than the neutral sticker, binomial probability, p = .017 (see Figure 3.7). These findings

suggest that children systematically chose the liked sticker for the other child, and avoided selecting the disliked sticker. However, even though children selected the liked sticker more than the neutral sticker, they also selected the neutral sticker marginally more than the disliked sticker. Thus, not all children simply matched the preferences expressed in the video to the new child's preferences.

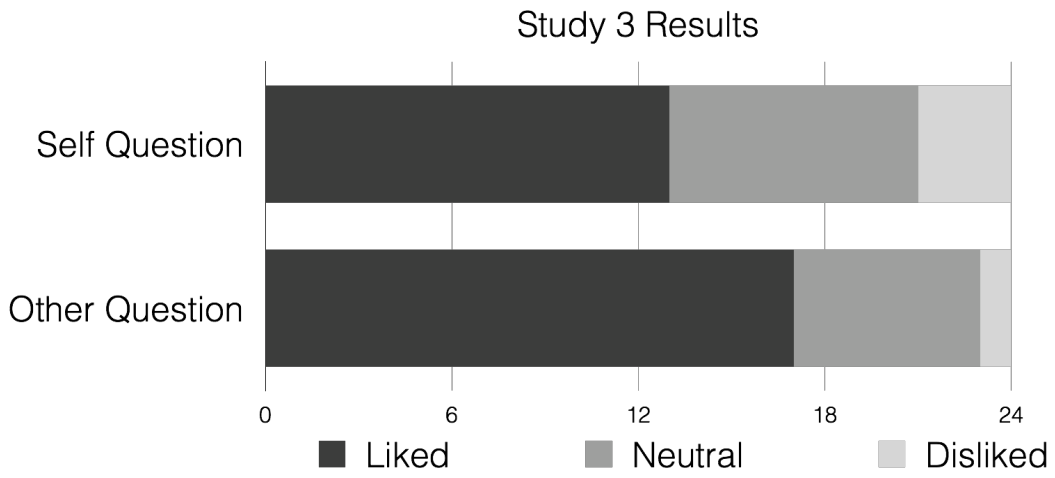

Figure 3.7. This figure depicts the frequencies of children choosing the liked, neutral, or disliked sticker for themselves (Self Question) and a new child (Other Question).

The overall pattern of children's responses did not significantly differ across the two questions, chi square χ^2 (2, N = 24) = 3.06, p = .216. However, 10 of the 24 children gave a different response to each question, which suggests that children did not consider the questions to be the same and/or did not simply repeat their first response for the second question. Importantly, there were no effects of question order on responses, nor were there any effects of gender. However, because all children overwhelmingly chose the liked or neutral stickers, those strong findings could be masking more subtle effects of gender. Taken together, the findings of these three studies suggest that children used their peers' preferences as a source of information

to guide their valuations of the stickers. The results also provide support for the claim that negative information plays a privileged role in children's choice behavior.

General Discussion

The present findings demonstrate that 3-year-old children assign relative and stable values to two discrete options, and use this value to systematically reward prosocial and/or punish non-prosocial agents. Further, children appear to incorporate information gleaned from observing others' preference into their own valuations of options. After viewing four peers express consistent preferences for one option over another, children appear to *devalue* the option their peers disliked, as they systematically avoided selecting it for a prosocial agent, a new child, and themselves. This indicates that children might utilize negative preference information (disliking) in a substantially different way from positive preference information (liking), such as privileging the role of negative information. However, in the resource distribution tasks, girls appeared to also increase their value of the option their peers liked, as they gave more liked than neutral stickers to the prosocial agents. This potentially indicates that girls are more influenced by the social information conveyed by their peers, more motivated to differentially distribute the options, and/or more sensitive to the social context of the experiment. Finally, boys and girls chose equally between the liked and neutral options as their own favorites, while avoiding the disliked options. This finding provides additional evidence that children incorporated their peers' dislikes into their valuations to a greater degree than their peers' likes. The potential role of a negativity bias, explanations for the gender difference, and the relationship between selecting options for others versus oneself will be considered in detail.

In Study 1, children systematically distributed their favorite (ostensibly higher-valued) sticker to the prosocial agents and their least-favorite (lower-valued) sticker to the non-prosocial

agents. However, because children only had two stickers and two choices of agents, it is not possible to determine whether children chose to distribute the higher-valued sticker to the prosocial agent (thus, by default distributing the lower-valued sticker to the non-prosocial agent), the lower-valued sticker to the non-prosocial agent (thus, by default distributing the higher-valued sticker to the prosocial agent), or a combination of both. However, Studies 2 and 3 included a third, non-valenced (i.e., neutral), option in an attempt to disentangle the relative influence of positively and negatively valenced preference information on children's valuations.

In Study 2, in the Negative Condition both boys and girls distributed more neutral stickers to the prosocial agents (and, thus, more disliked stickers to the non-prosocial agents). In the Positive Condition boys did *not* distribute more liked stickers to the prosocial agents than neutral stickers. This suggests that boys devalued the disliked sticker relative to the neutral sticker *more than* they increased their valuation of the liked sticker relative to the neutral sticker. In Study 3, both boys and girls selected the disliked sticker significantly less frequently than either the liked or neutral sticker for both a new child and themselves. One explanation for this pattern of findings is that stickers – including the neutral sticker – are already highly valued by children. Indeed, stickers were intentionally chosen for the stimuli *because* most children find them desirable. Arguably, *most* options that individuals have to choose between have some value, and to that end using stickers contributes to the ecological validity of this research. Thus, it might not be the case that children differentially incorporated the liked and disliked information into their valuations, but rather that the value added by their peers' expression of liking did not (or could not) substantially increase the value of that option over that of the neutral option.

Another possibility is that children privileged the role of the disliked – negative –

information in their valuations. It has been posited that a negativity bias, characterized by attending to, remembering, and learning from negative information to a greater degree than other information, is present early in development and guides children's behavior and learning (see Vaish et al., 2008, for a review). However, the types of negative information typically cited in discussions of the negativity bias are fear (e.g., Hertenstein & Campos, 2001; Mumme et al., 1996; Mumme & Fernald, 2003) and disgust (e.g., Carver & Vaccaro, 2007; Hornik, Risenhoover, & Gunnar, 1987; Moses, Baldwin, Rosicky, & Tidball, 2001). This fits with an evolutionary account, as individuals typically express fear and disgust when there is the potential for harm to occur, and the avoidance of harm offers clear adaptive advantages. For example, expressing fear could prevent someone from getting too close to the edge of a cliff, and expressing disgust could keep them from consuming spoiled food; two universal dangers. Preferences, in contrast, are inherently more subjective. As such, options that one individual likes might be disliked by another, and vice versa. Thus, it seems unlikely that children would explicitly equate an expression of dislike with one of danger. However, it is possible that children process both types of negative information similarly, and therefore treat disliked information *as if* it was harmful.

Children's expectations might also drive them to privilege disliked information. People are generally positive toward the world around them, and most options – those things they interact with in daily life – contain value. Further, when people encounter options they dislike, a common course of action is to ignore or avoid them, rather than overtly express dislike. In contrast, because individuals often interact with the things they prefer, they have many more opportunities to express explicit liking. For example, if someone orders a cone at a local ice cream shop, they are likely to choose a flavor they have tried before and know they like or one

that is similar to other flavors they know they like. Subsequently, when they remark on their choice, their comments are almost always positive; it would be rare to end up with an ice cream flavor they did not like. Thus, it is possible that children in the present studies were more sensitive to the explicitly disliked information because it was unexpected, and thus weighted it more heavily in their option valuations than the liked information. Importantly, these explanations for why children prioritized the disliked information are not mutually excusive, and might all contribute to the current pattern of results. Further, the differences between liked and disliked information do not detract from the more general finding that, at least in some circumstances, children are influenced by their peers' preferences.

One somewhat unexpected finding was that girls, in the resource distribution tasks (Study 2), distributed more liked than neutral stickers to the prosocial agents. In contrast, when choosing another child's favorite sticker (Study 3), both girls *and* boys selected more liked than neutral stickers. Together, those findings suggest that both girls and boys learned *something* about the value of the options their peers liked. However, girls incorporated that information into their resource distribution whereas boys did not. There are several possible explanations for these findings.

One explanation is that girls are more sensitive to social information than boys, and subsequently retain and/or integrate all social information into their behavior to a greater extent than boys. This explanation accounts for girls' use of the liked information throughout all the tasks, and boys use of the liked information only in Study 3. In Study 3, there was minimal lag time between when children viewed the videos and selected the stickers, and both events occurred at the same location, with little change in complexity of the environment. In contrast, in Study 2, after viewing the video, children completed the Reciprocity and Merit Tasks in two

separate locations. These changes increased the length of time children needed to retain the information in order to utilize it, and the complexity of the environment in which children were making their decisions. If boys are less sensitive to social information, *and* if the liked information was less salient than the disliked information, than boys many not have retained or considered that information to the same extent as girls. There is some indirect evidence from research on autobiographical memory in children that supports this explanation. Specifically, when retelling events, young girls talk considerably more about the social context (e.g., other people, relationships), and less about themselves, than boys (Buckner & Fivush, 1998; 2000; Tougu, Tulviste, & Suits, 2014). Whereas these studies do not disentangle children's memory for the events from their choice of information to retell, they do suggest that girls utilize social information to a greater degree than boys when considering past events – and this might extend to an increased sensitivity for their peers' preferences.

Alternatively, if boys and girls are equivalently sensitive to their peers' preferences, there are three additional explanations that could account for the gender differences observed in the present research. Two pertain to the differences between how girls and boys might act in social contexts. The first is that girls are more prosocial than boys, and the second is that girls are more motivated to produce socially desirable responses. The former hinges on the prosocial element of the resource distribution tasks – the act of giving the resources to the agents – that was not present when children were asked to select which of two stickers they thought another child would like. In such an account, girls are more *intrinsically* motivated than boys to behave in a helpful or prosocial manner, and this extends to differentially distributing the liked and neutral resources (presumably to reward the prosocial agents). In contrast, the latter explanation, social desirability, hinges on external motivations to differentially distribute the resources. In this

account, girls are more *extrinsically* motivated than boys to provide the response the experimenter would find most appropriate or expected, and this extends to giving the liked sticker to the prosocial agents.

There is mixed evidence to support the possibility that girls are more prosocial than boys. When gender differences have been observed in behavioral economics tasks, the reliable direction of this effect is females opting for more equitable distributions than males (e.g., Andreoni & Versterlund, 2001; Gummerum, Keller, Takezawa, & Mata, 2008; Murnigham & Saxon, 1998), though many studies do not find any gender differences (e.g., Gummerum, Hanoch, Keller, Parsons, Hummel, 2010; Hennefield & Markson, in prep.). In research most similar to the present work, Blake and Rand (2010) found that more girls than boys distributed at least one sticker in a DG task. However, of those children who distributed at least one sticker, there were no gender differences in children's distribution patterns for their favorite and least-favorite stickers. Blake and Rand consider this finding as evidence for greater prosocial behavior in girls, as distributing *any* resources in the DG is a departure from a rational utilitarian approach to maximizing gains. Similarly, Benozio and Diesendruck (2015) found that girls distributed more resources to out-group members than boys, which the researchers characterize as boys' strategic protection of resources for the good of their in-group. However, unlike the DG, the present resource distribution tasks were set up in such a way that *all* children were required to be prosocial (i.e., they were required to give one sticker to each of the agents). Further, there were no direct costs to children in terms of resource distribution, as children were not permitted to keep the any resources for themselves. Thus, from a strategic standpoint, it would seem that *all* children should have factored their peers' likes into their resource distribution, as the potential benefits (e.g., currying the most favor with the most prosocial agent), would seem to outweigh

the potential costs (e.g., cognitive resources to remember/use the liked information). In that light, attributing the gender differences found in the present work to increased prosociality in girls is not the most parsimonious explanation.

It is also unlikely that 3-year-old girl's responses were driven by an extrinsic desire to produce socially desirable responses. There is emerging evidence that by 5 years of age children begin to strategically manage their reputations. Five-year-old children share slightly more resources when they are being watched by a peer than when they are alone (Engelmann et al., 2012), when the recipient is aware of the quantity of options the child could distribute (Leimgruber et al., 2012), and when they are being watched by someone who could reciprocate later as well as an ingroup versus an outgroup member (Engelmann et al., 2013). In addition, 4-year-old children will publically, but not privately, conform to their peers, even when they know their peers are wrong (Haun & Tomasello, 2011). Thus, by the late preschool years, children appear to begin to manage their reputations. However, none of the aforementioned studies found differences in reputation management between girls and boys, nor is there any direct evidence to suggest that 3-year-old children engage in reputation management.

One final possibility is that the gender of the *agents* drove the gender effect, rather than (or in addition to) the gender of the participants. For example, it is possible that participants believed that girl-agents, but not boy-agents, would desire the liked stickers over the neutral stickers, or that prosocial girl-agents would be more likely than prosocial boy-agents to reciprocate in the future. As the gender of the participants was matched to the gender of the agents, the present study cannot offer insight into the likelihood of this account. However, there is some evidence from the extant literature to support this possibility. In particular, one study found robust evidence that children demonstrated an explicit preference for children of their own

gender, and this preference was almost entirely driven by girls' preferences for other girls. In a subsequent resource distribution task, the researchers again found effects of gender such that girls gave more resources to other girls than boys, but boys did not favor other boys over girls (Dunham et al., 2011). Thus, in the present study girls might have been more motivated to differentially reward other *girls*, but might not necessarily show that same distribution pattern if they were distributing resources to boys.

The mixed findings from the extant literature provide marginal support for each of these explanations and raise the possibility that the gender differences observed in Study 3 are not the result of single straightforward cause. However, girls' early understanding of gender norms might contribute to an increased sensitivity to social information, and potentially to increased prosocial behavior and consideration of the gender of the agents. Attending to others, demonstrating sensitivity to their needs, behaving prosocially, and promoting equality over conflict, are all more stereotypically associated with females than males. Thus, girls' behavior might be due to their internalization these gender norms, or external pressures to produce socially desirable actions. Some ways in which future studies could attempt to resolve these questions include uncoupling children's gender from that of the recipient and directly testing for gender differences in children's processing (e.g., attention, memory, etc.) of social information.

One final issue to consider is the relationship between selecting options for others versus selecting options for oneself. In Study 2, after completing the resource distribution tasks, children selected one of the two stickers as their favorite. In the Positive Condition, an equivalent number of children chose the liked and neutral stickers as their favorite. In the Negative Condition, a majority of children chose the neutral sticker as their favorite, systematically rejecting the disliked sticker. Similarly, in Study 3, children robustly chose the liked and neutral

stickers over the disliked stickers, with no differences found between the number of children who chose the liked and neutral stickers. In contrast, a majority of children chose the liked sticker *over* the neutral sticker as a new child's favorite. This finding fits with the account that values are computed at the time a choice is made, based on multiple dimensions of those options. When determining the preference of a new child, children had limited information to use in their valuation. Whereas the available information was not solely limited to their peers' preferences (i.e., children had information about the other child's gender, appearance, etc.), they arguably had little information to use to determine which option that child would find more valuable, and thus more heavily weighted the information they did have – their peers' preferences. In contrast, children had substantially more information to factor into their determination of their own favorite (e.g., their own gender, personal shape or color preferences, past experiences with similar options, etc.) – and thus their peers' preferences were weighted less heavily into their valuation. Alternative explanations, such as attributing children's distribution patterns to the social dynamics of the experimental context (e.g., social desirability), rather than a change in their valuations of the options, cannot be definitively ruled out. However, they are highly unlikely given the systematic differences between children's overall consideration of the liked and disliked stickers, differences in responses between choosing stickers for oneself and another child, and the corroborative findings between Studies 2 and 3.

In the present studies, the information children received about their peers' preferences was consistent across all four peers. This raises two limitations and potential directions for future research. The first concerns the consistency of the information. There is substantial evidence that young children are able to use statistical information to inform their learning, and this extends to using statistical information to infer others' preferences (Kushnir, Xu, & Wellman, 2010; Ma &

Xu, 2011). However, whether children attended to the internal consistency of the preference information (i.e., within-individual consistency) or the proportion of individuals who expressed a particular preference (i.e., between-individual consistency) is not known. For example, if children observed four peers express consistent preferences for liking option-A and disliking option-B, and then a fifth peer expressed disliking option-A and liking option-B, would observing that fifth person's preference (i.e., the opposite preference) serve to increase children's valuations of option-B relative to viewing consistent negative information toward option-B? It is possible that children equally weight each instance of a peers' preference expression, and would thus marginally increase their valuation for option-B. In contrast, children might consider the preferences expressions as one event, adopt the preferences of the majority and disregard the minority, and thus not change their valuation of option-B. Furthermore, if a negativity bias is driving children's devaluation of the disliked option, the absolute number of disliked expressions might not mater, but the consistency of the information could play a crucial role. If the negativity bias serves a fundamental protective function (i.e., to prevent individuals from interacting with objects or food that is potentially harmful), then observing even one instance of that disliked option being liked might substantially reduce or eliminate the negativity bias. If so, observing one peer like option-B might result in children substantially increasing their valuation for option-B relative to receiving consistent negative information about it. Answering this question is important to characterizing the types of information and contexts in which children are influenced by their peers' preferences.

Similarly, classic work on social influence and conformity has found a minimum of three informants necessary to elicit conformist behavior in adults (e.g., Asch, 1956). Four informants were used in the present study to equate gender, however it is unclear whether children *needed* to

view four different peers in order to be influenced by their preferences. One possibility is that, because the peers were strangers, children might have attended to the quantity and consistency of the preference expressions to a greater degree than they would if the peers were familiar. Future studies are needed to clarify the impact of informant attributes on children's option valuations and preferences.

One final point pertains to the medium in which children were exposed to their peers' preferences. These studies are the first to demonstrate that, not only are 3-year-old children's valuations are influenced by their peers preferences, but also that they are influenced when those preferences are presented via video. Young children often have more difficulty learning information from video than when that same information is presented live (e.g., Troseth et al., 2006; Troseth & DeLoache, 1998). Thus, it is likely that the current findings *underestimate* the extent to which children might incorporate their peers' preferences into their valuations. In a richer and more ecologically valid environment – such as observing a friend express a preference – children's valuations might be influenced by substantially less information.

There is a wealth of timely and pertinent information available via the social domain, and strategically extracting and utilizing such information could yield adaptive advantages. The present research indicates that young children can use social information – specifically, peers' preferences – to inform their relative valuation of options and subsequent preferences. Not only do 3-year-old children assign relative and consistent valuations to options for which they have an a priori preference, but they can use these valuations to systematically reward a prosocial agent and/or punish a non-prosocial agent. Further, after viewing four peers express a consistent preference for one option over another, children appear to devalue the option their peers disliked, as they systematically avoid selecting it for a prosocial agent, a new child, and themselves.

Interestingly, in certain contexts, girls appear to increase their value of the option their peers liked, whereas boys do not. This suggests that girls might be more sensitive to social information and social context than boys. It is possible that girls attend to and retain information acquired via observing their peers' preferences to a greater extent than boys, and utilize this information in relevant social contexts, such as distributing resources to others. Finally, children (boys *and* girls) chose equally between liked and neutral resources as their own favorite, while avoiding disliked resources. Taken together, the present findings suggest that children's object valuations are informed by the preferences of their peers. Further, subjective negative information (e.g., others' dislikes) appears to play a privileged role in influencing children's choice behavior. Together, these studies provide new insight into children's early economic reasoning, and highlight the role of other's preferences on children's developing valuations.

References

Baillargeon, R. (2004). Infants' physical world. *Current Directions in Psychological Science*, *13*(3), 89–94. doi:10.1111/j.0963-7214.2004.00281.x

Baldwin, D. A., Markman, E. M., Bill, B., Desjardins, R. N., Irwin, J. M., & Tidball, G. (1996). Infants' reliance on a social criterion for establishing word-object relations. *Child Development*, *67*(6), 3135–3153.

Baumard, N., Mascaro, O., & Chevallier, C. (2012). Preschoolers are able to take merit into account when distributing goods. *Developmental Psychology*, *48*(2), 492–498. doi:10.1037/a0026598

Benozio, A., & Diesendruck, G. (2015). Parochialism in preschool boys' resource allocation. *Evolution and Human Behavior*, 1–9. doi:10.1016/j.evolhumbehav.2014.12.002

Berti, A. E., & Bombi, A. S. (1981). The development of the concept of money and its value: A longitudinal study. *Child Development*, *52*(4), 1179. doi:10.2307/1129504

Birch, S. A. J., Vauthier, S. A., & Bloom, P. (2008). Three- and four-year-olds spontaneously use others' past performance to guide their learning. *Cognition*, *107*(3), 1018–1034. doi:10.1016/j.cognition.2007.12.008

Blake, P. R., & Rand, D. G. (2010). Currency value moderates equity preference among young children. *Evolution and Human Behavior*, 1–11. doi:10.1016/j.evolhumbehav.2009.06.012

Buckner, J. P., & Fivush, R. (1998). Gender and self in children's autobiographical narratives. *Applied Cognitive Psychology*, *12*(4), 407–429. doi:10.1002/(sici)1099-0720(199808)12:4<407::aid-acp575>3.0.co;2-7

Buckner, J. P., & Fivush, R. (2000). Gendered themes in family reminiscing. *Memory*, *8*(6), 401–412. doi:10.1080/09658210050156859

Burris, V. (1983). Stages in the Development of Economic Concepts. *Human Relations*, *36*(9), 791–812. doi:10.1177/001872678303600901

Carver, L. J., & Vaccaro, B. G. (2007). 12-month-old infants allocate increased neural resources to stimuli associated with negative adult emotion. *Developmental Psychology*, *43*(1), 54–69. doi:10.1037/0012-1649.43.1.54

Corriveau, K. H., Fusaro, M., & Harris, P. L. (2009). Going with the flow: Preschoolers prefer nondissenters as informants. *Psychological Science*, *20*(3), 372–377. doi:10.1111/j.1467-9280.2009.02291.x

Csibra, G., & Gergely, G. (2009). Natural pedagogy. *Trends in Cognitive Sciences*, *13*(4), 148–153. doi:10.1016/j.tics.2009.01.005

Dunham, Y., Baron, A. S., & Carey, S. (2011). Consequences of "minimal" group affiliations in children. *Child Development*, *82*(3), 793–811. doi:10.1111/j.1467-8624.2011.01577.x

Engelmann, J. M., Herrmann, E., & Tomasello, M. (2012). Five-year olds, but not chimpanzees, attempt to manage their reputations. *PLoS One, 7(10)*, e48433. doi:10.1371/journal.pone.0048433

Engelmann, J. M., Over, H., Herrmann, E., & Tomasello, M. (2013). Young children care more about their reputation with ingroup members and potential reciprocators. *Developmental Science*, *16*(6), 952–958. doi:10.1111/desc.12086

Fawcett, C.A., & Markson, L. (2009). Infants place equal value on preference information from familiar or unfamiliar individuals. Poster presented at the Society for Research in Child Development, Denver, CO.

Fawcett, C. A., & Markson, L. (2010a). Children reason about shared preferences. *Developmental Psychology*, *46*(2), 299–309. doi:10.1037/a0018539

Fawcett, C. A., & Markson, L. (2010b). Similarity predicts liking in 3-year-old children. *Journal of Experimental Child Psychology*, *105*(4), 345–358. doi:10.1016/j.jecp.2009.12.002

Feigenson, L., Carey, S., & Hauser, M. (2002). The representations underlying infants' choice of more: object files versus analog magnitudes. *Psychological Science*, *13*(2), 150–156.

Feigenson, L., Dehaene, S., & Spelke, E. (2004). Core systems of number. *Trends in Cognitive Science*, *8*(7), 307–314. doi:10.1016/j.tics.2004.05.002

Feinman, S., & Lewis, M. (1983). Social referencing at ten months: A second-order effect on infants' responses to strangers. *Child Development*, *54*(4), 878–887.

Gergely, G., Nádasdy, Z., Csibra, G., & Bíró, S. (1995). Taking the intentional stance at 12 months of age. *Cognition*, *56*(2), 165–193. doi:10.1016/0010-0277(95)00661-h

Graham, S. A., Stock, H., & Henderson, A. M. E. (2006). Nineteen-month-olds' understanding of the conventionality of object labels versus desires. *Infancy*, *9*(3), 341–350. doi:10.1207/s15327078in0903_5

Haun, D. B. M., & Tomasello, M. (2011). Conformity to peer pressure in preschool children. *Child Development*, *82*(6), 1759–1767. doi:10.1111/j.1467-8624.2011.01666.x

Hennefield, L. & Markson, L. (in press). In you don't want it neither do I: Social influences on children's choices. *Journal of Experimental Child Psychology.*

Hennefield, L. & Markson, L. Peer influence on young children's preferences. Manuscript in preparation.

Herrmann, E., Hernandez-Lloreda, M. V., Call, J., Hare, B., & Tomasello, M. (2010). The Structure of Individual Differences in the Cognitive Abilities of Children and Chimpanzees. *Psychological Science*, *21*(1), 102–110. doi:10.1177/0956797609356511

Hertenstein, M. J., & Campos, J. J. (2001). Emotion regulation via maternal touch. *Infancy*, *2*(4), 549–566. doi:10.1207/s15327078in0204_09

Hornik, R., Risenhoover, N., & Gunnar, M. (1987). The effects of maternal positive, neutral, and negative affective communications on infant responses to new toys. *Child Development*, *58*(4), 937–944. doi:10.1111/j.1467-8624.1987.tb01431.x

Hsee, C. K. (1998). Less is better: when low-value options are valued more highly than high-value options. *Journal of Behavioral Decision Making*, *11*(2), 107–121. doi:10.1002/(sici)1099-0771(199806)11:2<107::aid-bdm292>3.0.co;2-y

Jaswal, V. K., & Neely, L. A. (2006). Adults don't always know best: Preschoolers use past reliability over age when learning new words. *Psychological Science*, *17*(9), 757–758. doi:10.1111/j.1467-9280.2006.01778.x

Kanngiesser, P., & Warneken, F. (2012). Young children consider merit when sharing resources with others. *PLoS ONE*. doi:10.1371/journal.pone.0043979.g001

Keil, F., Stein, C., Webb, L., Billings, V. D., & Rozenblit, L. (2008). Discerning the division of cognitive labor: An emerging understanding of how knowledge is clustered in other minds. *Cognitive Science, 32*(2), 259–300. doi:10.1080/03640210701863339

Kenward, B., & Dahl, M. (2011). Preschoolers distribute scarce resources according to the moral valence of recipients' previous actions. *Developmental Psychology*, *47*(4), 1054–1064. doi:10.1037/a0023869

Kinzler, K. D., Corriveau, K. H., & Harris, P. L. (2010). Children's selective trust in native-accented speakers. *Developmental Science*, *14*(1), 106–111. doi:10.1111/j.1467-7687.2010.00965.x

Koenig, M. A., & Harris, P. L. (2005). Preschoolers mistrust ignorant and inaccurate speakers. *Child Development*, *76*(6), 1261–1277. doi:10.1111/j.1467-8624.2005.00849.x

Kushnir, T., Xu, F., & Wellman, H. M. (2010). Young children use statistical sampling to infer the preferences of other people. *Psychological Science*, *21*(8), 1134–1140. doi:10.1177/0956797610376652

Leimgruber, K. L., Shaw, A., Santos, L. R., & Olson, K. R. (2012). Young children are more generous when others are aware of their actions. *PLoS ONE, 7(10),* e48292. doi:10.1371/journal.pone.0048292

LoBue, V., Nishida, T., Chiong, C., DeLoache, J. S., & Haidt, J. (2009). When getting something good is bad: Even three-year-olds react to inequality. *Social Development*, *20*(1), 154–170. doi:10.1111/j.1467-9507.2009.00560.x

Lucas, M. M., Wagner, L., & Chow, C. (2008). Fair game: The intuitive economics of resource exchange in four-year olds. *Journal of Social, Evolutionary, and Cultural Psychology*, *2*(3), 74–88. doi:10.1037/h0099353

Ma, L., & Xu, F. (2011). Young children's use of statistical sampling evidence to infer the subjectivity of preferences. *Cognition*, *120*(3), 403–411. doi:10.1016/j.cognition.2011.02.003

Moses, L. J., Baldwin, D. A., Rosicky, J. G., & Tidball, G. (2001). Evidence for referential understanding in the emotions domain at twelve and eighteen months. *Child Development*, *72*(3), 718–735.

Mumme, D. L., & Fernald, A. (2003). The infant as onlooker: learning from emotional reactions observed in a television scenario. *Child Development*, *74*(1), 221–237.

Mumme, D. L., Fernald, A., & Herrera, C. (1996). Infants' responses to facial and vocal emotional signals in a social referencing paradigm. *Child Development*, *67*(6), 3219. doi:10.2307/1131775

Olson, K. R., & Spelke, E. S. (2008). Foundations of cooperation in young children. *Cognition*, *108*(1), 222–231. doi:10.1016/j.cognition.2007.12.003

Padoa-Schioppa, C. (2011). Neurobiology of economic choice: A good-based model. *Annual Review of Neuroscience*, *34*(1), 333–359. doi:10.1146/annurev-neuro-061010-113648

Repacholi, B. M., & Gopnik, A. (1997). Early reasoning about desires: evidence from 14- and 18-month-olds. *Developmental Psychology*, *33*(1), 12–21.

Rochat, P., Dias, M. D. G., Guo Liping, Broesch, T., Passos-Ferreira, C., Winning, A., & Berg, B. (2009). Fairness in Distributive Justice by 3- and 5-Year-Olds Across Seven Cultures. *Journal of Cross-Cultural Psychology*, *40*(3), 416–442. doi:10.1177/0022022109332844

Sarnecka, B. W., & Carey, S. (2008). How counting represents number: What children must learn and when they learn it. *Cognition*, *108*(3), 662–674. doi:10.1016/j.cognition.2008.05.007

Schaefer, D. R., Light, J. M., Fabes, R. A., Hanish, L. D., & Martin, C. L. (2010). Fundamental principles of network formation among preschool children. *Social Networks*, *32*(1), 61–71. doi:10.1016/j.socnet.2009.04.003

Shutts, K., Banaji, M. R., & Spelke, E. S. (2009). Social categories guide young children's preferences for novel objects. *Developmental Science*, *13*(4), 599–610. doi:10.1111/j.1467-7687.2009.00913.x

Siegler, R. S., & Thompson, D. R. (1998). " Hey, would you like a nice cold cup of lemonade on this hot day": Children's understanding of economic causation. *Developmental Psychology*, *34*(1), 146–160. doi:10.1037//0012-1649.34.1.146

Sloane, S., Baillargeon, R., & Premack, D. (2012). Do infants have a sense of fairness? *Psychological Science*, *23*(2), 196–204. doi:10.1177/0956797611422072

Sobel, D. M., & Kushnir, T. (2013). Knowledge matters: How children evaluate the reliability of testimony as a process of rational inference. *Psychological Review*, *120*(4), 779–797. doi:10.1037/a0034191

Sommerville, J. A., Schmidt, M. F. H., Yun, J.-E., & Burns, M. (2013). The development of fairness expectations and prosocial behavior in the second year of life. *Infancy*, *18*(1), 40–66. doi:10.1111/j.1532-7078.2012.00129.x

Spelke, E. S., Breinlinger, K., Macomber, J., & Jacobson, K. (1992). Origins of knowledge. *Psychological Review*, *99*(4), 605–632.

Strouse, G. A., O'Doherty, K., & Troseth, G. L. (2013). Effective coviewing: Preschoolers' learning from video after a dialogic questioning intervention. *Developmental Psychology*. doi:10.1037/a0032463.supp

Thompson, D. R., & Siegler, R. S. (2000). Buy low, sell high: the development of an informal theory of economics. *Child Development*, *71*(3), 660–677.

Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: the origins of cultural cognition. *Behavioral and Brain Sciences*, *28*(5), 675–91– discussion 691–735. doi:10.1017/S0140525X05000129

Tougu, P., Tulviste, T., & Suits, K. (2014). Gender differences in the content of preschool children's recollections: A longitudinal study. *International Journal of Behavioral Development*, *38*(6), 563–569. doi:10.1177/0165025414537922

Troseth, G. L., & DeLoache, J. S. (1998). The medium can obscure the message: young children's understanding of video. *Child Development*, *69*(4), 950–965.

Troseth, G. L., Saylor, M. M., & Archer, A. H. (2006). Young Children's Use of Video as a Source of Socially Relevant Information. *Child Development*, *77*(3), 786–799. doi:10.1111/j.1467-8624.2006.00903.x

Tversky, A., & Kahnemann, D. (1981). The framing of decisions and the psychology of choice. *Science, 211,* 453-458.

Vaish, A., Grossmann, T., & Woodward, A. (2008). Not all emotions are created equal: The negativity bias in social-emotional development. *Psychological Bulletin*, *134*(3), 383–403. doi:10.1037/0033-2909.134.3.383

van Leeuwen, E. J. C., & Haun, D. B. M. (2013). Conformity in nonhuman primates: fad or fact? *Evolution and Human Behavior*, *34*(1), 1–7. doi:10.1016/j.evolhumbehav.2012.07.005

VanderBorght, M., & Jaswal, V. K. (2009). Who knows best? Preschoolers sometimes prefer child informants over adult informants. *Infant and Child Development*, *18*(1), 61–71. doi:10.1002/icd.591

Woodward, A. (1998). Infants selectively encode the goal object of an actor's reach. *Cognition*, *69*(1), 1–34. doi:10.1016/s0010-0277(98)00058-4

Chapter 4: Conclusion

This research had two primary goals: (1) to develop methodology to assess value discrimination in young children, and (2) to investigate how young children's option valuations – and subsequent preferences – might be influenced by the preferences of their peers. These goals were realized across four empirical studies. The study presented in Chapter 2 used an established resource distribution methodology, the Dictator Game (DG), to test whether 4-year-old children's preferences were influenced by the preferences of their peers. Children observed, via video, four peers display the same preference for one of two stickers. Each peer expressed liking one sticker and disliking the other. Then children completed two rounds the DG; one with each sticker type. If their peers' preferences influenced children's own preferences, we expected children to keep more liked than disliked stickers for themselves. Indeed, more children kept more liked than disliked stickers, indicating their distribution patterns were influenced by their peers' preferences. This finding also suggests that children extracted *informational* content about the value of the stickers from their peers and used that to guide their own preferences. To the best of my knowledge, this is the first study to provide evidence that 4-year-old children's preferences are influenced by the preferences of their peers. However, these findings also raise questions for future research and highlight several limitations of using the DG to assess value discrimination in young children.

The problems with using the DG as a method for testing questions concerning value discrimination can be attributed to two factors: too much freedom in how the resources can be distributed, and children factoring their own desires for the resources into their decision making processes. Whereas these are key functions of the DG as a method of assessing fairness and prosocial behavior, they are not necessary to assess value discrimination, and might produce

substantial noise when used in that manner. These concerns become further amplified when comparing children's distribution patterns across multiple rounds of the DG. Thus, the two subsequent value discrimination tasks developed for the studies presented in Chapter 3 eliminated these concerns. These new resource distribution tasks were predicated on the assumption that children would use the value of a resource as a means of rewarding prosocial agents and/or punishing non-prosocial agents. Thus, children learned about the prosociality of two agents (one who was prosocial, one who was not prosocial) and then distributed one resource to each agent. Once children had selected one resource to distribute to one agent, they had no choice but to give the complementary resource to the other agent. Further, because of these reduced task demands, this method allowed testing these questions in 3-year-old children.

The first of three studies presented in Chapter 3 aimed to test the assumption that, when distributing one higher-valued resource and one lower-valued resource distribute between a prosocial and a non-prosocial agent, children would systematically distribute the higher-valued resource to the prosocial agent. Previous research demonstrated that children use quantity (i.e., number and size) to distribute resources of higher value (i.e., more instances or a larger instance) to a prosocial agent (e.g., Kenward & Dahl, 2011; Baumard, Mascaro, & Chevallier, 2012). However, one goal of the present research was to assess whether children would distribute two resources that differed on some dimension *other than* and *unrelated to* quantity. This research thus adopted the same assumption as Blake and Rand (2010) – that children's preferences reflect the underlying value they assign to resources. Prior to partaking in the resource distribution tasks, 3-year-old children selected their favorite (ostensibly higher-value) and least-favorite (ostensibly lower-value) sticker from an array of stickers. Children were then given those two stickers to distribute in two tasks. In each task, children were instructed to give one sticker to an

agent who behaved prosocially (i.e., gave them a gift, cleaned up blocks) and one to an agent who was not prosocial (i.e., did not give them a gift, did not clean up blocks). Children reliably distributed their favorite sticker to the prosocial agent, suggesting that 3-year-old children assign relative and stable value to options, and they are able to use the value of a resource to systematically reward prosocial and/or punish non-prosocial agents. This study is the first, to my knowledge, to demonstrate that children as young as 3 years of age assign relative value to resources that is not predicated on quantity. Further, this study also introduces two new value discrimination tasks that could potentially be used to assess whether children's resource valuation changes as a function of an experimental manipulation.

The second study presented in Chapter 3 aimed to test whether observing other children's resource preferences would influence 3-year-old children's valuations of those resources. As in the DG study from Chapter 2, children viewed four peers sequentially display the same preference for one of two stickers (liking one and disliking the other). Children were then given *either* the liked sticker and a neutral sticker (Positive Condition) ***or*** the disliked sticker and neutral sticker (Negative Condition) to distribute in the same two tasks as the previous study. If children incorporated preference information into their object valuations, it was predicted that they would give the liked sticker (over the neutral sticker) to the prosocial agents in the Positive Condition, and would give the neutral sticker (over the disliked sticker) to the prosocial agents in the Negative Condition. In the Positive Condition, girls gave the liked sticker to the prosocial agents more often than would be expected by chance. In the Negative Condition both girls *and* boys gave the disliked sticker to the prosocial agent significantly *less* often than would be expected by chance. These findings indicate that children incorporated information gleaned from observing their peers preferences into their own valuation of options. Specifically, both girls and

boys avoided giving the disliked sticker to the prosocial agents, suggesting they devalued that sticker relative to the neutral sticker. Further girls, but not boys, appeared to increase their valuation of the liked sticker relative to the neutral sticker, as they reliably gave the liked sticker to the prosocial agents.

The third study in Chapter 3 directly tested whether children thought a new child would prefer a sticker that was liked by peers over one that was disliked. This study also aimed test whether 3-year-old children's own preferences were influenced by those of their peers. After viewing their peers preferences, children were presented with all three stickers – the sticker their peers had liked, the sticker they disliked, and a new, neutral sticker. When asked which sticker a new gender-matched child would like, children reliably chose the liked sticker over the disliked *and* neutral sticker. In contrast, when asked which sticker they liked best, children selected equally between the liked and neutral sticker and reliably *avoided* the disliked sticker. These findings provide additional evidence that children incorporated their peers' dislikes into their valuations to a greater degree than their peers' likes. Further, these findings also suggest that children differentially weighted the influence of their peers' preferences in their valuations depending on the context in which the valuation occurred. When children were asked to determine the preference of a new child, they had limited information to use in their valuation. Thus, their peers' preferences, as one salient piece of information, were heavily weighted in their valuation. In contrast, when children determined their own preference for one of the stickers, they had substantially more information (e.g., their own gender, personal shape or color preferences, past experiences with similar options, etc.) to factor into their preference – and thus their peers' preferences were weighted less heavily in their valuation. This might have served to further lessen the value differences between the liked and neutral options; however, children still

avoided choosing the disliked sticker for themselves, indicating that the disliked information was weighted more heavily than the liked information.

That children's valuations are influenced by their peers is a notable and novel contribution to the burgeoning literature on children's learning from others. In the present studies, it is also possible, in addition to acquiring information, that children also incorporated their peers' preferences into their own preferences for social benefits (e.g., peer support, friendship, access to group resources, etc.). Attending to and learning from others' preferences, thus, might be a strategic way in which children combine knowledge acquisition with strengthening social bonds. In acquiring value information via the observation of peers' preferences, children can learn about generally agreed upon, potentially culture-specific, values. Further, adopting the preferences of peers can potentially demonstrate similarity and belonging, indicate trustworthiness as a social partner, and serve as a bid to peers for social engagement.

The recent findings that 4-year-old children will occasionally conform publically (out loud) after hearing a majority of peers offer an incorrect response, yet can privately (via pointing) indicate the correct response (Haun & Tomasello, 2011) suggests that young children can engage in acts ostensibly *solely* for social benefits. These findings are consequential because they demonstrate that children, like adults (e.g., Asch, 1956), will, at least in certain circumstances, prioritize conforming to a majority over providing factually correct information, and *not* incorporate information from the majority into their own knowledge. However, circumstances in which those demands conflict are arguably rare. People generally behave in appropriate, adaptive ways, and thus, garnering information from others preferences might be an adaptive strategy. The present studies point to at least one circumstance in which children might use peers' assertions for informational *and* social benefits.

If children gain social benefits from adopting the preferences of their peers, an important question raised by the present findings is whether children's option valuations would also be influenced by *adults'* preferences, or if they are specifically sensitive to the preferences of their peers. One important, and compelling, reason for assessing the influence of peers' preferences was to determine whether children considered their peers a good source of information from which to learn the value of resources. A second reason was to determine whether children would utilize information that was presented from a non-authoritative source. Thus, if children do acquire value information from adults' preferences it might not be for the same reasons as when they acquire that value information from children. Further, it is also plausible that, like learning objective information (e.g., VanderBorght & Jaswal, 2009; Rakoczy, Hamann, Warneken, & Tomasello, 2010), children consider the content or domain of the information when deciding from whom to learn. For example, children acquire information about the value of stickers from peers, and this might extend to other child-focused content such as toys and games. In contrast, children might turn to adults to acquire information about the value of adult-focused content.

Children might also consider the social context, and make a more nuanced assessment between peers and adults. For example, children might differentially adopt the preferences of new peers as a bid for friendship, especially in situations in which they are likely to encounter that peer again. In contrast, children might not adopt the preferences of a new adult as readily, because they are not angling for social benefits, and instead use familiarity or cues to expertise in considering whether to learn from adults' preferences. Further, in the present studies children did not (could not) have a preference for one of the options prior to viewing their peers' preferences. Thus, this research demonstrates that peers' preferences influenced children's *acquisition* of preferences, but does not offer insight into whether peers' preferences would also have the

capability of changing established preferences. However, if others' preferences can change established preferences, it might also be the case that the aforementioned motivations (i.e., contexts in which to learn from a peer or an adult) would also factor into whether children's preexisting preferences changed as a result of observing others' preferences.

One final question of importance pertains to whether preference acquisition via others' preferences extends beyond the object domain, to social preferences (e.g., who to interact with or befriend) or ideological values (e.g., what moral, political, and cultural, beliefs to hold). The present studies cannot directly speak to this question; however, there is no a priori reason to believe that learning from other's preferences is limited to objects. Further, for any meaningful transfer of cultural information (i.e., beyond the initial social benefits and ease of making a quick decision) these influences need to persist over time. Future studies are needed to further clarify from whom children will acquire preference information, the types of information that can be acquired via preferences, and the extent to which that information persists over time.

Social and cognitive processes are inextricably linked; social development relies on cognitive capacities, and cognition develops steeped in the social world. The social world is a rich source of information, and young children are able to use others actions and behavior – including their subjective preferences – to learn about the world. Together, the studies presented in this dissertation provide evidence that young children's option valuations, and subsequent preferences, are influenced by the preferences of their peers. Corroborative findings from an established resource distribution task (Chapter 2), and two new tasks developed to assess value discrimination in young children (Chapter 3) demonstrate that children extract *informational* content about the value of options from observing their peers preferences, and use that value to guide their own preferences. Further, subjective negative information (e.g., others' dislikes)

appears to play a privileged role in influencing children's choice behavior. Taken together, the present studies provide new insight into children's early economic reasoning, and highlight the role of other's preferences on children's developing object valuations.

References

Asch, S. E. (1956). A minority of one against a unanimous majority. *Psychological Monographs General and Applied*, *70*(9), 1–70.

Baumard, N., Mascaro, O., & Chevallier, C. (2012). Preschoolers are able to take merit into account when distributing goods. *Developmental Psychology*, *48*(2), 492–498. doi:10.1037/a0026598

Blake, P. R., & Rand, D. G. (2010). Currency value moderates equity preference among young children. *Evolution and Human Behavior*, 1–11. doi:10.1016/j.evolhumbehav.2009.06.012

Haun, D. B. M., & Tomasello, M. (2011). Conformity to peer pressure in preschool children. *Child Development*, *82*(6), 1759–1767. doi:10.1111/j.1467-8624.2011.01666.x

Kenward, B., & Dahl, M. (2011). Preschoolers distribute scarce resources according to the moral valence of recipients' previous actions. *Developmental Psychology*, *47*(4), 1054–1064. doi:10.1037/a0023869

Rakoczy, H., Hamann, K., Warneken, F., & Tomasello, M. (2010). Bigger knows better: Young children selectively learn rule games from adults rather than from peers. *British Journal of Developmental Psychology*, *28*(4), 785–798. doi:10.1348/026151009X479178

VanderBorght, M., & Jaswal, V. K. (2009). Who knows best? Preschoolers sometimes prefer child informants over adult informants. *Infant and Child Development*, *18*(1), 61–71. doi:10.1002/icd.591